Protect Your People™

Includes articles on:

- Understanding chemical protection Type 3 & 4 standards - *page 8*
- Understanding chemical permeation and the standard permeation test - *pages 14 & 15*
- Understanding infectious agent protection and EN 14126 - *page 21*
- Understanding anti-static and the EN 1149 standard - *page 28*
- Understanding radiant heat in the EN 11612 standard - *page 38*
- Understanding Arc Flash heat protection - *page 39*

Also includes new protective clothing selection flow chart - *centre pages*

Lakeland®

Buyers Guide

to the complete range of Lakeland CE certified clothing for protection against Chemicals, Flames, Heat and Arc Flash

Why choose Lakeland?

Lakeland CE Certified Protective Clothing Range

This catalogue provides an overview of the full range of CE certified protective clothing manufactured by Lakeland Industries Inc.

Lakeland is the original manufacturer of disposable protective clothing; its predecessor being the first to produce garments using polymer fibre-based nonwovens. Lakeland has several decades of experience in the development, design, manufacture and supply of limited life protective workwear.

Originating in Alabama, USA and with a head office in New York, the company increasingly has a global and growing footprint with production facilities and sales offices in most regions of the world. Lakeland protective clothing is now used by industrial, medical and emergency response personnel in over 40 countries. Lakeland Protects People, and the drive to protect more workers better, globally, continues.

Lakeland products are now used the world over for multiple applications in many industries, including Mining, Agriculture, Chemical & Petrochemical, Gas, Electrical, Water, Oil and Gas, Construction, Pharmaceutical and many others. If your people need protection from industrial chemical and flame and heat hazards, Lakeland can provide the protection.

Lakeland is known for high quality, derived from a high level of experience and expertise. This perhaps explains why the company was one of the global manufacturers approached by the UK government's Department For International Development (DFID) in 2014 for supply of garments for use by aid workers in the Ebola relief effort in Sierra Leone.

The full range of CE certified product is outlined here. For more detail, or for advice on chemical suit and Type 5 & 6 coverall selection, request individual product data sheets or one of our guides to garment selection – all available in multiple languages.

For more information contact **nastevenson@lakeland.com**

Other Product Guides and Datasheets Available

The Guide to Selection of Chemical Suits
A guide to the key factors for consideration in selecting the best chemical suit for the job to maximise protection and comfort whilst minimising cost.

The Guide to Selection of Type 5 & 6 Coveralls
What are the key factors in selecting a Type 5 & 6 disposable coverall and how do you select the best one for the job?

This guide looks at the key issues and guides users to which fabric type is the best for different applications.

Product sheets
Individual product sheets include details on specific products

All products shown in this brochure are fully certified to the latest relevant CE standards.

Copies of CE Certificates are available on request and Certificates of Conformity are available to download from our web site at **www.lakeland.com/europe**

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More information on products and protective clothing issues including articles and useful guidance can be found in the Lakeland Europe blog on the Lakeland website: **www.lakeland.com/europe**

Detailed selection guides and data sheets on all products are available to download from our website.

Product Pages

Chemical Suits page 5 - 12

A range of clothing for protection against hazardous liquid, vapour and gaseous chemicals.

Types 3 & 4						Type 1
ChemMax® 1EB	ChemMax® 1	ChemMax® 2	ChemMax® 3	ChemMax® 4 Plus	ChemMax® Encapsulating Suits	Interceptor® Plus

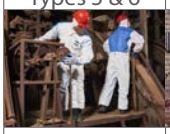
Types 5 & 6 (& Type 4) page 17-20

A range of clothing for protection against hazardous dusts and light liquid sprays and splashes.

Types 5 & 6					& Type 4
SafeGard™ GP	SafeGard™ 76	SafeGard™ 76 Diamant	MicroMax® NS	MicroMax®	MicroMax® TS

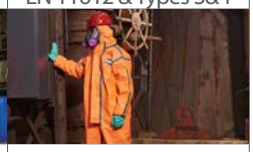
Cool Suits page 26-28

A range of clothing for protection against hazardous liquid, vapour and gaseous chemicals.

Types 5 & 6	Type 4			
				
MicroMax® NS Cool Suit	MicroMax® TS Cool Suit	ChemMax® 1 Cool Suit	ChemMax® 3 Cool Suit	Pyrolon™ CRFR Cool Suit

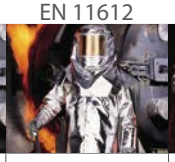
Chemical/ FR Protection page 31-33

A range of clothing combining chemical protection and flame retardency

EN 14116 & Types 5 & 6		EN 14116 & Types 3&4		EN 11612 & Types 3&4
				
Pyrolon™ Plus 2	Pyrolon™ XT	Pyrolon™ CRFR	ChemMax® CBFR	Pyrolon™ TPCR

ALM® Heat Protection page 35-36

A range of aluminised approach and proximity clothing for heat protection

EN 11612		
		
ALM® 300	ALM® 500	ALM® 700

ARC & Heat Protection page 40-42

A range of clothing for protection against the heat hazards of arc flash and CE certified fire-fighters clothing

EN 61482-1&2	Multi-risk	EN 469
ARC® 43	ARC® Flash	Fire Fighters

Introduction: Clothing For Protection Against Hazardous Chemicals

pages 4 to 14 cover chemical protective clothing

Type 4 EN 14605	Type 3 EN 14605	Type 1 EN 943-1&2
protection against sprays of hazardous liquids	protection against jet sprays of hazardous liquids	protection against hazardous vapours and gases
Type 4 Garments: ChemMax® 1 EB *(page 5)* MicroMax® TS Cool Suit *(page 26)* ChemMax® Cool Suits *(page 27)* Pyrolon™ CRFR Cool Suit *(page 28)*	**Type 3 & 4 Garments:** TomTex® *(page 5)* ChemMax® 1 and 2 *(page 6)* ChemMax® 3 and 4 *(page 7)* Pyrolon™ CRFR, CBFR, TPCR *(page 32-33)*	**Type 1 Garments:** Interceptor® Plus *(page 10-11)* *Note: Type 2 has been removed in the 2015 version of EN 943 so no longer exists.*

Consider three key factors when selecting the most appropriate clothing for an application

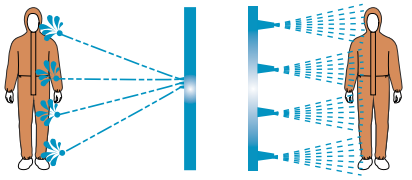
1. The chemical

- 'Breakthrough time' provided by (EN 6529 or ASTM F739) permeation tests can be used for comparison of fabrics but provides no information about how long you are safe.
- Consider the hazard presented by the chemical:
  How toxic is it?
  Is it harmful in very small quantities?
  Is it carcinogenic or causes long term harm in other ways?
- Is the application performed in a warm temperature? (permeation rates increase at higher temperatures). What effect does temperature have on the safe use time?
- Calculate a maximum safe use time using permeation rates, temperature & chemical toxicity.

Use **PermaSURE®** to calculate safe-use times for Lakeland chemical suits **ChemMax® 3**, **ChemMax® 4 Plus** and **Interceptor® Plus** *(See page 14-15)*

2. Which hazard / spray type?

- Protection against gases and vapours may require a Type 1 gas-tight suit such as Interceptor® Plus *(pages 10-11)*
- The type of spray in the application indicates whether a Type 3, 4 or 6 garment is required.
- However, with a highly toxic chemical even if the spray type indicates a Type 6 garment, a higher level of protection might be appropriate.



Type 3 Strong jet sprays — **Type 4** Shower sprays

Approximately 80% or more applications in the market are Type 4 and not Type 3. *(See page 8)*

Type 3 or Type 4?

Determining that the application is Type 4 rather than Type 3 means selecting more comfortable options such as a **ChemMax® Cool Suit.** *(See pages 25 - 28)*

3. Physical / environment factors

- A variety of factors relating to the task and where it is performed can influence the choice of garment.
- Three groups of factors can be considered.

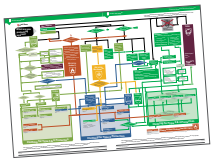
Factors relating to :

The Task	The Environment	Others
For example: Kneeling / crawling? Climbing? Confined space? Mobility?	For example: Visibility? Moving vehicles? Sharp edges? Heat or flames? Warm conditions? Explosive atmosphere?	For example: Co-ordination with other PPE? Training required? Donning and doffing? Regulatory issues?

All such factors may influence the choice of fabric and garment design: (physical properties, colour, noise level and additional properties such as flammability).

CE standard physical tests can be used to assess comparative performance in terms of durability using abrasion resistance, tear strength etc.

Request Lakeland's '**Guide to Chemical Suit Selection**' for more details, including chemical permeation and physical properties comparison tables.



See centre pages for a flow chart guide to selection of chemical suits.

ChemMax® 1EB

Lightweight Type 4 chemical suit ideal for tank cleaning, spray cleaning and infectious agent protection - 87gsm.

- Very lightweight, soft and flexible fabric.
- Low noise level - improved comfort and safety.
- Cost effective Type 4 chemical protection. (Type 3 with additional tape on flap)
- Infectious Agent Barrier - passes at highest classes in all four EN 14126 bio-hazard tests (this version was used extensively by UK Government health workers in 2015 West African Ebola Crisis).
- Thumb loops to secure sleeves.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	2
Flex Cracking	ISO 7854	1
Trapezoidal Tear	ISO 9073	4/3
Tensile Strength	EN 13934	3/2
Puncture Resistance	EN 863	2
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Seam Strength	EN 13935-2	Class 4
Burst Resistance	EN 13938-1	2

Styles available: L428IEB
For more information, see page 13

Available in: Yellow

For chemical permeation test results:
See Chemical Suit Selection Guide

⚠ ChemMax® 1EB achieves Type 3 only with the zip flap securely taped up.

ChemMax® 1

Lightweight coverall for Type 3 & 4 protection against a wide range of chemicals - 87gsm.

- Very lightweight, soft and flexible fabric.
- Low noise level - improved comfort and safety.
- Very cost effective Type 3 & 4 chemical protection.
- Infectious Agent Barrier - passes at highest classes in all four EN 14126 bio-hazard tests (the EB version used extensively by UK Government health workers in 2015 West African Ebola Crisis).
- Cushioned double-layer knee pads for increased comfort and safety.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	2
Flex Cracking	ISO 7854	1
Trapezoidal Tear	ISO 9073	4/3
Tensile Strength	EN 13934	3/2
Puncture Resistance	EN 863	2
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Seam Strength	EN 13935-2	Class 4
Burst Resistance	EN 13938-1	2

Styles available: 428, L428, 430, 430G, 400, 450, 527, 025, 024, 023NS, 021
For more information, see page 13

Available in: Yellow Green

For chemical permeation test results:
See Chemical Suit Selection Guide

ChemMax® 2

Stitched & Taped Seams
TYPE 3-B
TYPE 4-B
TYPE 5-B
TYPE 6-B
EN 1073-2
EN 1149-5
EN 14126

Propriatory established chemical barrier film laminated to spunbond PP substrate -135gsm.

- Extremely soft and flexible compared to coveralls offering similar protection level.
- White with grey seams for easy identification and high visibility.
- Low noise level - improved comfort and safety.
- Low price compared to other coveralls offering similar protection.
- Permeation testing achieves similar or better result on 66% of 100 chemicals tested compared to more expensive competitors.
- Cushioned double-layer knee pads for increased comfort and safety.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	6
Flex Cracking	ISO 7854	6
Trapezoidal Tear	ISO 9073	4
Tensile Strength	EN 13934	3
Puncture Resistance	EN 863	2
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Seam Strength	EN 13935-2	4

Styles available: 428, L428, 430, 430G, 400, 450, 527, 025, 024, 023NS, 021

For more information, see page 13

Available in: White with grey seams

SUPER B-STYLE by Lakeland

For chemical permeation test results:
See Chemical Suit Selection Guide

ChemMax® 3

Powered by PermaSURE®

Stitched & Taped Seams
TYPE 3-B
TYPE 4-B
TYPE 5-B
TYPE 6-B
EN 1073-2
EN 1149-5
EN 14126

Lightweight coverall for Type 3 & 4 protection against a wide range of chemicals - 170gsm.

- Co-extrusion fabric construction. Results in smoother and more consistent fabric than bonded or glued competitors.
- Superior softness and flexibility and more consistent chemical barrier (no 'pinching' or thinner bond points as seen in competitor fabrics).
- European manufactured fabric, tested against a full range of chemical warfare agents for anti-terror and civil defence operations.
- Very low noise level. Safer and improved comfort.
- Cushioned double-layer knee pads for increased comfort and safety.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	6
Flex Cracking	ISO 7854	4
Trapezoidal Tear	ISO 9073	5/4
Tensile Strength	EN 13934	3
Puncture Resistance	EN 863	2
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Seam Strength	EN 13935-2	4

Styles available: 428, L428, 430, 430G, 400, 450, 527, 025, 024, 023NS, 021

For more information, see page 13

Available in: Grey Orange

SUPER B-STYLE by Lakeland

For chemical permeation test results:
See Chemical Suit Selection Guide

PermaSURE® Use PermaSURE® *(page 15)* to access instant safe-use times against over 4000 chemicals

ChemMax® 4 Plus
Powered by PermaSURE®

Stitched & Taped Seams
TYPE 3-B
TYPE 4-B
TYPE 5-B
TYPE 6-B
EN 1073-2
EN 1149-5
EN 14126

Superior multi-layer barrier films laminated to spunbond PP substrate - 220gsm.

- Co-extrusion fabric construction. Results in smoother and more consistent fabric than bonded or glued competitors.
- Superior softness and flexibility and more consistent chemical barrier (no 'pinching' or thinner bond points as seen in competitor fabrics).
- European manufactured fabric. Tested against a full range of chemical warfare agents for anti-terror and civil defence operations.
- Very soft and flexible material for enhanced comfort.
- Cushioned double-layer knee pads for increased comfort and safety.

Physical Properties

Property	EN Standard	CE Class
Abrasion Resistance	EN 530	6
Flex Cracking	ISO 7854	1
Flex Cracking @ -30°c	ISO 7854	2
Trapezoidal Tear	ISO 9073	MD 5/ CD 4
Tensile Strength	EN 13934	3
Puncture Resistance	EN 863	2
Anti-Static (Surface Resistance)	EN 1149-5/1	<2.5 x 10^9 ohms
Seam Strength	EN 13935-2	4

Styles available: 428, L428, 430, 430G, 400, 450, 527, 025, 024, 023NS, 021

For more information, see page 13

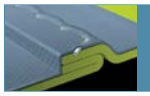
Available in: Military Green, Yellow

SUPER B-STYLE

For chemical permeation test results:
See Chemical Suit Selection Guide

PermaSURE® Use PermaSURE® *(page 15)* to access instant safe-use times against over 4000 chemicals

ChemMax® Encapsulating Suits


Stitched & Taped Seams
TYPE 3-B
TYPE 4-B
TYPE 5-B
TYPE 6-B
EN 1073-2
EN 1149-5
EN 14126

ChemMAX® Encapsulating suits use a fully encapsulating design including full hood with face visor & attached boots

- Rear entry encapsulating suit with 20mil PVC visor
- Flat and expanded back versions available (see styles below)
- Attached boots with boot overflaps
- Rear mounted zip with storm flap
- One hood-mounted exhaust port with protective shroud to allow escape of exhaled air
- Elastic wrists (use with push-lock connection system - not supplied - optional extra: *see page 9*)
- Spacious and generous design for comfort and freedom of movement
- Available in ChemMAX® 1, 2, 3 and 4 Plus fabrics.
- Certified to Types 3 & 4. These are not gas-tight suits and are not suitable for protection against hazardous gases and vapours

Styles available:

400 - Flat back with air inlet hose

To be worn with a breathing mask fed by compressed air hose. This can be fed through the air inlet hose to the mask worn inside the suit. The exhaust valve allows escape of exhaled air.

450 - Expanded back for internally worn self-contained breathing apparatus

To be worn with self-contained breathing apparatus for breathing purposes. The exhaust valve allows escape of exhaled air.

Available in: ChemMax 1, 2, 3 and 4 Plus

Colours according to fabric choice

For physical properties and chemical permeation data:

See properties on ChemMax 1, 2, 3 and 4 Plus.

PermaSURE®

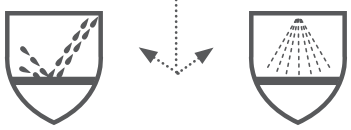
Use PermaSURE® with ChemMAX® 3 and 4 PLUS *(page 15)* to access instant safe-wear times on over 4000 chemicals

Selection of Chemical Suits: The benefits of understanding Type 3 & 4 differences

Why is it useful to understand the differences between Type 3 and 4?

2 reasons!
Higher comfort and lower cost

CE Standard EN 14605
clearly defines two different types of protection



These types of spray hazard are different.
Yet most garments on the market are **BOTH Type 3 and Type 4.** → Why?

Understanding the difference between Type 3 & 4 and deciding which applies to your application can be important in targeting the best protection whilst maximising comfort and minimising cost.

Most applications are Type 4 rather than Type 3.
So buying a Type 3 garment can mean both paying for more protection than needed AND sacrificing improved levels of comfort.

So what is the difference between Type 3 and 4?

The standard CE finished garment type tests (defined in EN 17491 parts 3 and 4) are useful in understanding the differences.

Test Method

A test suit is sprayed with a liquid to identify the effectiveness of the suit in preventing penetration.

The temperature and lowered surface tension of the liquid are carefully controlled.

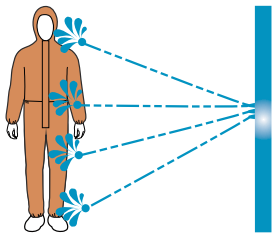
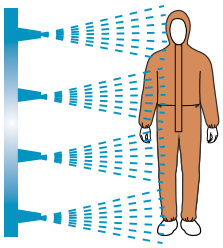
Three garment samples are tested. Specific criteria are used in determining a pass or fail.

! 'Pass' does not mean 'no penetration'!

A 'pass' in liquid penetration type tests does not mean that NO chemical has penetrated inside the garments.

Some minimal penetration is allowed across the three samples. This is determined using a specific calibration method related to the liquid used in each specific test.

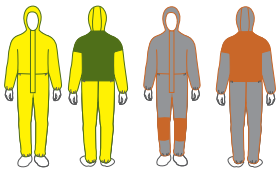
Whilst the allowance is minimal, it should be considered when protecting against chemicals that can be harmful in very small quantities.

EN 14605 EN 17491-3	Type 3: 'jet' sprays	EN 14605 EN 17491-4	Type 4 : 'liquid' sprays
	• Single jet sprays. • High pressure on garment. • Directed at weak points on the garment. • No specified liquid volume - depends on the number of points used in the test.		• Four nozzles - shower sprays onto garment. • Low pressure on garment. • Approximately 4.5 litres of liquid sprayed onto rotating garment in one minute.

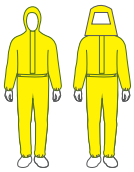
Note: The Type 4 test sprays some 4.5 litres of liquid over the garment in one minute. This is a considerable volume and indicates that a Type 4 garment is still effectively liquid tight, even though it may not protect against the type of directed high pressure sprays used in a Type 3 test.

Identifying that your application is a Type 4 rather than a Type 3 means greater flexibility to choose a garment that may be more comfortable and cost less such as:

ChemMax® 1EB
Simple design ChemMax® 1 coverall for Type 4 applications *(page 5)*



ChemMax® Cool Suits
Breathable Type 4 chemical protection for greater comfort *(page 27)*



ChemMax® Ensemble
Jacket with hood and separate pants or 3-piece jacket, hood with visor and pants for more flexibility.

Push-Lock® Glove Connection System

TYPE 3

Tested to Type 3 with ChemMax® 1, 2, 3 and 4 Plus suits

Unique system to connect chemical gloves to ChemMax® coverall sleeves.

- Two concentric plastic rings clip together with glove and sleeve between.
- Provides liquid-tight seal tested and approved to Type 3 Jet Spray with ChemMax® 1, 2, 3 and 4 Plus garments.
- Multi-use so more cost effective.
- Simpler and quicker to use and fit compared to traditional taping of sleeve and glove.
- Available in cartons of 20 rings (to equip 5 garments)

The Lakeland Push-Lock® Glove Connection System provides a secure alternative to using the traditional method of adhesive tape to seal the glove to the garment sleeve.

There are several advantages:-

Adhesive Tape	Push-Lock® Glove Connection
Haphazard - no control or knowledge as to whether the tape actually creates a seal.	Tested to the Type 3 Jet test with ChemMax ®1, 2, 3 and 4 Plus
Two operatives needed - the tape must be applied by another operative after the suit is donned.	The user attaches the gloves before donning the suit.
Cost - correct chemical tape for gloves sealing is expensive.	The Push-Lock® glove connection system can be used repeatedly - the more uses the more cost effective it becomes.
Cost control - very difficult to control how much tape is used.	Cost is known precisely and gets less with re-use.
Uncomfortable - tape MUST be applied tightly to the wrist if it is effective.	The Push-Lock® system sits loosely and comfortably on the wrist.
Must be removed by another operative and damages the suit sleeve, making it unusable in the process.	Suit is removed by the user with the gloves attached. Suit can be re-used if undamaged and uncontaminated.

How does it work?

Interceptor® Plus

Powered by PermaSURE®

EN 943 TYPE 1a

Interceptor® Plus is Lakeland's gas-tight, Type 1a chemical protective coverall. It should be used with an internally worn SCBA for full protection against a wide range of hazardous chemicals in liquid, gaseous and vapour form.

- Multi-layer film technology creates a light and flexible high barrier against a wide range of high hazard chemicals. Weight 365gsm.
- Certified to EN 943-1:2015+A1:2019 Type 1a (Note: excluding clause 5.4)
- Superior design featuring double-taped seams (inside & out).
- Standard or wide-vision visor options; two-layer visor with unique sealing technology for high chemical barrier.
- Double layer chemical glove system.
- European manufactured fabric. Tested against a full range of chemical warfare agents for anti-terror and civil defence operations.
- Very soft and flexible material for enhanced comfort.
- Front and rear entry design options.
- Inner chemical glove with outer 27mil butyl glove.
- Two rear mounted exhaust valves.
- Attached sock boot with boot overflaps.

PermaSURE® Use PermaSURE® *(page 15)* to access instant safe-use times against over 4000 chemicals

Physical Properties

Property	EN Standard	CE Class
Abrasion Resistance	EN 530	6
Flex Cracking	ISO 7854	2
Trapezoidal Tear	ISO 9073	6
Tensile Strength	EN 13934	4
Puncture Resistance	EN 863	2
Seam Strength	EN 13935-2	6

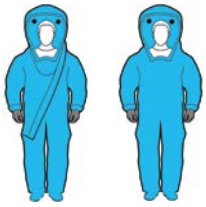
EN 6529 Chemical Permeation Test Results

Chemical	CAS No.	CE Class
Acetone	67-64-1	6
Acetonitrile	70-05-8	6
Carbon Disulphide	75-15-0	6
Dichloromethane	75-09-2	6
Diethylamine	209-89-7	6
Ethyl Acetate	141-78-6	6
n-Hexane	110-54-3	6
Methanol	67-56-1	6
Sodium Hydroxide (40%)	1310-73-2	6
Sulphuric Acid (96%)	7664-93-9	6
Tetrahydrafuran	109-99-9	6
Toluene	95-47-6	6
Chemical- gas		
Ammonia 99%	7664-41-7	6
Chlorine 99.5%	7782-50-5	6
Hydrogen Chloride (99%)	7647-01-0	6

EN 6529 measures the time until the rate of permeation of the chemical through the fabric reaches 1.0µg /min/cm², defined as the "Normalised Breakthrough". This is NOT an indication of safe-use time or that a wearer is safe wearing the suit in any specific application. **Powered by PermaSURE® easy-to-use smartphone app with quick access to safe-wear times for over 4000 chemicals.**

See the Guide to Chemical Suit Selection or web site chemical search page for full list of chemicals tested.

Interceptor® Plus Styles



Basic Style Options
ICP 640 - Front entry / standard width visor
ICP 650 - Rear entry / standard width visor
ICP 640W - Front entry / wide vision visor
ICP 650W - Rear entry / wide vision visor

Available in: Blue Yellow

Fully encapsulated suit featuring double layer visor, gas-tight zip and attached boots and gloves:
- Expanded back, attached sock boots with boot flaps
- Seams sealed inside and out
- 122cm gas tight zipper with outer storm flaps
- Neoprene double layer attached gloves
- 2 exhaust valves
- Inside waist belt
- Storage bag included

Chemical Warfare Agents

Interceptor® Plus has been tested independantly against permeation by common chemical warfare agents according to the FINABEL test method. (1 x 50 µg / 37°c / 24H)

Agent	Acronym	No of tests	Fabric result hours:min	Seam result hours:min
Sulfur mustard	HD	3	>24:00	>24:00
Lewisite	L	3	>24:00	>24:00
V-Agent	VX	3	>24:00	>24:00
Sarin	GB	3	>24:00	>24:00
Tabun	GA	3	>24:00	>24:00
Soman	GD	3	>24:00	>24:00

Note: that testing has been conducted against the Interceptor® Plus fabric and the seam. In the tests, the challenge was made against the seam with 50% of the fabric only and 50% on the seam. As can be seen no permeation was recorded in 24 hours across 3 tests on each agent.

Interceptor® Plus Design features

Powered by PermaSURE®

Fully sealed to the external environment, the Interceptor® Plus coverall is worn with SCBA inside the suit - a generous backpack allows use of most portable breathing apparatus. Interceptor® Plus includes as standard a number of design features making it the best choice for gas-tight protection available.

Unique and patented "etched" sealing system for more secure seal between visor and garment fabric.

Double layer face shield:
Outer - 0.25mm Teflon
Inner - 1.00mm PVC
Offers superior chemical barrier with flexibility

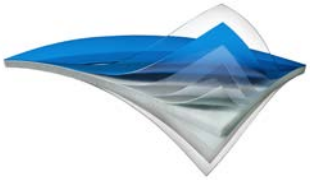
Standard (42cm) or wide-vision (63cm) visor options.

Rear pouch for accommodation of internal SCBA

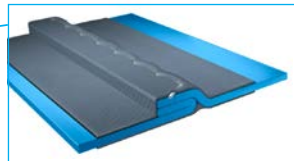
Two protected rear mounted exhaust valves: one at the back and one at rear of hood.

122cm gas-tight zip with front-entry or rear-entry options.

Two layer glove system: inner chemical barrier glove and outer Butyl glove - bonded together for improved comfort



Soft and flexible 365gsm multi-layer fabric… the unique combination of polymers results in a high barrier to a wide range of chemicals.



Stitched and double taped seams, inside and out.

Attached sock with boot overflap.

- Carry case, along with cotton liner gloves, anti-mist wipes supplied with each garment.
- All Interceptor® Plus suits undergo an **internal pressure test** to confirm suit is gas-tight before leaving the factory as part of the final quality assurance check.
- For shelf-life and storage please see page 43.

The **Interceptor® Plus Pressure Test Kit** includes everything you need to conduct regular tests including connection hoses and valves, air blower and magnahelic pressure gauge.

Use as part of a regular maintenance system to ensure your Interceptor® Plus suit remains gas tight.

Available separately.

See the Lakeland video on conducting a pressure test at:

http://www.lakeland.com/europe/blog/cat/technicalvideos/post/Pressure-Test-Kit/

Lakeland sales staff will also conduct training on donning & doffing and conducting internal pressure tests for your staff on delivery of your initial Interceptor® Plus suits.

Interceptor® Plus works with:

PermaSURE®

Safe-Use Time Toxicity Modeller

Contact Lakeland for more details. *(see page 15)*

EPVC Chemical Suit

TYPE 3 TYPE 4 EN 1149-5

PVC coverall and two piece ensemble for protection against splashes and sprays of liquid chemicals

- Superior lightweight PVC fabric – weight 310gsm. Lighter than most PVC coveralls
- Zip front fastening with double storm flap and hook & loop closure
- Certified to EN 14605 Type 3 & 4 for protection against liquid and jet chemical sprays
- Anti-static - certified to EN 1149-5: tested to EN 1149-3 (charge decay)
- Tested for up to 20 washes at 30°C*
- Coverall features Super-B style with 3-piece respirator-fit hood, crotch gusset and inset sleeves for superior freedom of movement
- Ideal for petrochemical applications such as tank cleaning and chemical storage applications, agricultural applications and chemical handling

* Physical properties and permeation tests conducted before washing. Garments contaminated with chemicals should not be washed and re-used. Inspect all garments before re-use; garments that are damaged or worn should not be re-used.

Physical Properties

Property	EN Standard	CE Class
Abrasion Resistance	EN 530	6
Flex Cracking	ISO 7854	6
Trapezoidal Tear	ISO 9073	2
Tensile Strength	EN 13934	3
Puncture Resistance	EN 863	3
Seam Strength	EN 13935-2	4
Anti-Static	EN 1149-3	t_{50} = 0.89s

Chemical Permeation - EN 6529

Chemical	CAS No.	CE Class
Acetic Acid 30%	64-19-7	6
Hydrochloric Acid 30%	7647-01-0	6
Phenol/Sodium Hydroxide 1:1	139-02-6	6
Sodium Hydroxide 50%	1310-73-2	6
Sodium Hypochlorite	7681-52-9	6
Sulphuric Acid 50%	7664-93-9	6

* NB = normalised breakthrough. This is the time taken for the PERMEATION RATE to reach 1.0µg/minute/cm² in controlled laboratory conditions at 23°c. It is NOT the point at which breakthrough first occurs. **For safe use times see Selection Guide and PermaSURE®.**

Styles Available

EPVC428V	Coverall with respirator hood, double zip front fastening with hook & loop velcro
EPVCJT02	Jacket with respirator-fit drawstring hood, zip front with double storm flap and hook & loop fastening
EPVCTS02	Bib & brace style pants with adjustable braces and quick release snaps

Lakeland Cool Vest® - ECV50C

<< *Alternatively to help workers stay more cool and more comfortable, try one of Lakelands range of Cool Suits® offering Type 4 to 6 protection against a range of hazardous dusts and chemicals.* *(see page 25)*

Cool Vest® is designed to be worn underneath any chemical suit to keep the wearer cool & comfortable in warm environments

- Uses phase change material pouches to maintain a cooling temperature of 14°C for up to 3 hours*
- Four pouches are inserted into pockets inside the vest; two in the back and two in the front.
- Pouches gradually absorb heat from the body so the wearer stays cool, resulting in improved work rates and productivity.
- Phase-change pouches are easily 'charged' by placing in a refrigerator, in cool water or simply in a cool area overnight.
- Cool Vest® fabric is 100% 180gsm cotton with pockets made in 100gsm polyester mesh.
- Available in two sizes : S-L and XL-XXL
- Available as a single vest with one set of cooling phase-change pouches.
- Sets of cooling pouches available separately so that one set can be charged whilst one is used to allow continuous working.

** Subject to work type, ambient temperature and environment*

The Cool Vest® can be worn with any chemical suit in order to enhance the bodies own ability to remove heat by absorbing heat energy directly from the body.

The result can be improved moral, increased work rates and higher productivity.

Styles and Accessories

Most Lakeland fabrics are available in a variety of full coveralls and partial body garments and accessories

ChemMax® Chemical Suits (pages 4 to 15)

428
Coverall with elasticated hood, cuffs,waist & ankles. Double front zip fastening, cushioned kneepads.
Size: S - XXXL

L428
Coverall with elasticated hood, cuffs,waist & ankles. Double front zip fastening, cushioned kneepads. Thumb loops.
Size: S - XXXL

430
Coverall 'Plus' with hood and attached feet/boot flap Elasticated cuffs and waist. Double front zip fastening, cushioned kneepads.
Size: S - XXXL

430G
Coverall 'Plus' with hood and attached feet and gloves using Push-Lock® connection. Elasticated cuffs,waist & ankles. Double front zip fastening, cushioned kneepads.
Size: S - XXXL

527
Smock / Gown with rear entry / ties and elasticated cuffs.
Size: M - XL

025
Apron with ties.
Size: M - XL

024
Sleeves
Size: One size

400
Encapsulating suit with flat back. To be worn with a breathing mask fed by compressed air hose. This can be fed through the air inlet hose to the mask worn inside the suit.
Size: S - XXXL

450
Encapsulating suit with expanded back. To be worn with self-contained breathing apparatus for breathing purposes.
Size: S - XXXL

023NS
Overboots with anti-slip sole.
Size: L - XL

021
Cape hood with rear inlet pigtail.
Size: One size

HD02
Cape hood with visor, shaped shoulders and head harness.
Size: One size

HH
Jacket with hood, double zip and storm flap and double cuffs.
Size: M - XXL

HC
Jacket with collar, double zip and storm flap and double cuffs.
Size: M - XXL

PT
Pants with tunnelised waist elastic and elasticated ankles.
Size: M - XXL

Type 5 & 6 Protection (pages 16 to 20)

428
528 (SafeGard™ GP only)
Coverall with elasticated hood, cuffs,waist & ankles.
Size: S - XXXL

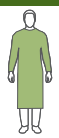
L428
L528 (SafeGard™ GP only)
Coverall with elasticated hood, cuffs waist & ankles. Thumb loops.
Size: S - XXXL

414
Coverall with elasticated hood, cuffs and attached socks
Size: S - XXXL

L414
Coverall with elasticated hood, cuffs and attached socks. Thumb loops.
Size: S - XXXL

101
Lab coat with 2 hip pockets, 4 stud fastening
Size: M - XL

101Z
Lab coat with 2 hip pockets, zip fastening
Size: M - XL



527
Smock / Gown with rear entry / ties and elasticated cuffs. **Size: M - XL**

024
Sleeves
Size: One size

020
Cape hood with elasticated face opening.
Size: One size

022
Standard overshoes with elasticated tops.
Size: One size

22NS
Overshoes with elasticated tops, anti-slip soles.
Size: One size

22ANS
Overshoes with elasticated tops, anti-static soles.
Size: One size

Pyrolon™ (pages 28 to 31) Note: Pyrolon™ XT and CRFR only)

428
Coverall with elasticated hood, cuffs,waist & ankles.
Size: S - XXXL

101
Lab coat with 2 hip pockets, 4 stud fastening
Size: M - XL

514
Jacket with elasticated cuffs
Size: S - XXXL

016
Trousers with elasticated waist.
Size: S - XXXL

019
Rear entry gown with elasticated cuffs.
Size: M - XL

022NS
Overshoes with anti-slip soles
Size: One size

023NS
Overboots with anti-slip soles and ties.
Size: One size

Individual Item Product Codes

The codes listed above represent item STYLE codes. Complete product codes are formulated as follows: **[Fabric Code][Style Code][Size Code]** Eg: ESGP428XL = *SafeGard™ GP coverall with elasticated hood, cuffs waist and ankles, size Xlarge.* Size Codes are **S, M, L, XL, XXL, XXXL** Fabric codes are shown on the table below.

SafeGard™ GP	ESGP	MicroMax® TS	EMNT*	ChemMax® 4 Plus	CT4S	Pyrolon™ CRFR	ECR
SafeGard™ 76	ES	ChemMax® 1	CT1S	Pyrolon™ Plus 2	EPW	Pyrolon™ CBFR	EBR
MicroMax® NS	EMN	ChemMax® 2	CT2S	Pyrolon™ XT	EX	Pyrolon™ TPCR	ETP
MicroMax®	EM	ChemMax® 3	CT3S				

* MicroMax® TS is MicroMax® NS fabric constructed with taped seams to achieve Type 4 liquid spray protection.

Note: Not all styles shown are available in all fabrics from local stocks. Specials styles, unique designs and bespoke garments are available on request.
Minimum order quantities and/or advance orders may be required. Contact Lakeland to discuss your requirements.

Product codes for Interceptor Plus®, ALM®, ARC®, ARC® X rainwear and CE OSX® fire fighters clothing are shown on the product pages.

Colour Options

SafeGard™ GP, SafeGard™ 76 and MicroMax® NS are available in different colours. Colours other than the standard white are specified in the code with the addition of a letter for each colour as follows:

SafeGard™ GP White	**[ESGP][Style Code][Size Code]**
SafeGard™ GP Blue	**[ESGP][Style Code][Size Code]**
SafeGard™ GP Orange	**[ESGP][Style Code][Size Code]**
SafeGard™ 76 White	**[ES][Style Code][Size Code]**
SafeGard™ 76 Blue	**[ESB][Style Code][Size Code]**
SafeGard™ 76 Orange	**[ESO][Style Code][Size Code]**
MicroMax® NS White	**[EMN][Style Code][Size Code]**
MicroMax® NS Orange	**[EMN][Style Code][Size Code]**

Understanding Permeation and Permeation Test Data

Permeation *is the process by which a chemical will pass through a fabric at a molecular level. Many users of chemical suits refer to 'breakthrough' in a permeation test to indicate that a suit is safe to use. However, they are often unaware that permeation testing is intended for comparison of fabric performance only and is not suitable to indicate safe use. This article explains why.*

If you are involved in chemical suit selection you will be familiar with chemical permeation test breakthrough times - often (incorrectly) used to indicate whether a wearer is safe or not against a specific chemical.

However, test breakthrough does not indicate when the chemical first breaks through the fabric, but is recorded when the RATE OF PERMEATION reaches 1.0µg / min / cm²*. (Point B on the graph) *(* In the CE standard test. The ASTM standard test uses 0.1ug / min / cm²)*

Thus, as the graph indicates, at the point of test breakthrough *the chemical has already been permeating through the fabric and may have come into contact with the user.*

Does this mean you are safe or not?

Without more analysis of the volume permeated and the toxicity of the chemical, you simply don't know. The fact is, permeation test breakthrough provides no information about how long a user is safe against a specific chemical.

What should permeation test breakthrough be used for?

The CE Test standard EN 6529 clearly states that permeation test data is intended for comparison of fabric permeation resistance performance - in other words it can indicate whether the performance against a chemical is better for one fabric than another. The standard also states that permeation test data cannot be used to indicate whether a wearer is safe or not for any specific duration.

The problem of temperature

All permeation tests are conducted at 23°C in order to ensure compatibility of results. However, it is known that permeation rate increases with temperature. So if you work in a higher temperature than 23°C the permeation test may be indicating a much lower rate of permeation than in the real world where permeation may occur much more quickly.

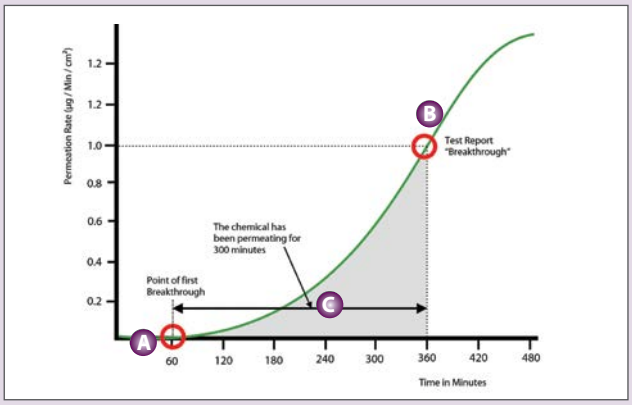
So how do you know how long you are safe?

Safe-use time - the time a chemical suit can be worn before permeated volumes of the chemical may reach levels that may cause harm - can be calculated. *(see page 15)*

This requires information on permeation rate (taking into account the effect of temperature), the toxicity of the chemical and duration and extent of possible contamination.

However, PermaSURE® (see page 15) is a free downloadable tool that calculates safe use time for ChemMax® 3, ChemMax® 4 Plus and Interceptor® Plus coveralls against over 4,000 chemicals in seconds.

Graph of Permeation Rate



- Most users believe the 'breakthrough' quoted in chemical permeation test results is at A - where the chemical is first identified "breaking through" the fabric.
- However, 'breakthrough', (more correctly called 'normalised breakthrough') is actually measured at the point when the RATE or SPEED that permeation is taking place reaches 1.0µg/Min/cm² - at B on the graph.
- At the point of breakthrough B therefore the chemical has already been permeating through the fabric since the point of first breakthrough at A and may have come into contact with the wearer. (duration of permeation is indicated by C on the graph).
- Given that the shaded area below the line represents the volume (per min per cm²) permeated through the fabric in that time, the question is *"Will that volume cause harm?"*
- The answer depends on the toxicity of the chemical. For chemicals that present a long term hazards such as carcinogens, this might be critical.

Permeation test data and the problem of long term toxicity

Chemicals that present an immediate hazard - such as acids that burn or toxins that have an immediate effect are less problematic.

However, given that a chemical is permeating through the fabric before the test 'breakthrough' is reached, for users relying on test breakthrough as an indication of a safe use time, long term toxicity presents a real and possibly unrecognised risk.

If users wear a chemical suit on a regular basis to protect against such a chemical, under the impression (from permation test data) that NO chemical is permeating through the fabric, it is quite possible that they are coming into contact with small quantities of the chemical on a regular basis and over a long period of time.

If this is the case, whilst no indication of any problem is apparent on a day to day basis… only in the long term as health problems develop will the hazard become apparent.

If you rely solely on permeation test breakthrough to indicate safe-use you might be coming into contact with longer term toxicity chemicals on a regular basis... without even knowing it.

PermaSURE®

What is PermaSURE® ?

Permeation test breakthrough is NOT when the chemical first breaks through the fabric and provides NO information on how long you are safe. *(see page 14)*

Permeation test data can be used for comparison of fabric perfomance but does not indicate safe-use time.

Users that rely on permeation test data to indicate how long they are safe may be coming into contact with small amounts of the chemical. This could be critical in the case of highly toxic chemicals or chemicals with long term toxicity.

To be safe: users need to calculate a safe-use time.

To find a safe-use time, calculate volume permeated using permeation rate, exposed area and exposure time:-

Permeation Rate	x	Area of Contamination	x	Duration of Contamination	=	Volume permeated

Manual calculation of safe-use time is problematic because of the difficulty in accessing relevant information such as permeation rates and chemical toxicity.

If volume permeated < chemical toxicity **= SAFE**

If volume permeated < chemical toxicity **= NOT SAFE**

This can then be compared with published toxicity limits for chemicals:

PermaSURE® is a free downloadable smart-phone app.

that quickly calculates safe-use time for over 4,000 chemicals based on temperature and the specific toxicity of the chemical.

1 Garment Tab
- Choose the garment used
- Input suit and chemical temperature
- Enter the duration of exposure (the maximum time you may be exposed to the chemical)

2 Chemical Tab
- Choose the chemical from over 4,000 in the database

3 Assessment Tab
- click Calculate

4 & 5
If **safe**, go ahead.
If **not safe**, revise the task or upgrade to a higher level of protection.

! The molecular model behind PermaSURE® was developed in conjunction with the UK Ministry of Defence for assessing protection against chemical warfare agents.

EN 14325:2018
The 2018 version of EN 14325 supports the PermaSURE® principle!

The new standard clearly states that using permeation test data to indicate safe use of a chemical suit is dangerous and introduced a new method of classifying chemical permeation resistance using the same principle as PermaSURE®, assessing the volume of chemical permeated over time and using the toxicity of the chemical to determine a safe wear time.

PermaSURE® allows users to calculate safe-use times for ChemMax® 3 & 4 Plus and Interceptor® Plus garments based on real world data including temperature and exposed area.

PermaSURE®

works on any browser-enabled device

- Works on any browser enabled tablet or smartphone with internet connection.
- Simple to use. Easy-to-access interface with data input and output fields.
- User inputs suit type, exposure time, temperature and chemical. PermaSURE® provides key hazard data and in seconds an assessment of whether the user is safe in the input exposure time.
- Over 4,000 chemicals in the database.
- PermaSURE® calculates safe-use times taking into account temperature and the toxicity thresholds of specific chemicals.
- PermaSURE® provides instant basic chemical hazard data and single-click links to detailed online safety data sheets.

PermaSURE® is a registered trade mark of Industrial Textile & Plastics Ltd, Easingwold. UK

Introduction: Clothing For Protection against Type 5 and 6 Hazards

pages 17 to 20
cover clothing for
Type 5 & 6 protection

The 'Type' testing explains these protection types.

Type 5 EN 13982 protection against hazardous dry particles	EN 1073-2 protection against dust contaminated with radiation	Type 6 EN 13034 protection against reduced/light liquid sprays and splashes
Type 5- Hazardous Dry Particles - Spray cabin filled with dust - Subject performs exercise on treadmill - 3 particle counters INSIDE the suit - Particle "Inward leakage" calculated - Recorded as % of inward leakage (TIL)	**EN 1073-2** testing is a variation of the standard Type 5 test.	**Type 6 - Reduced Liquid (aerosol) Spray** - Four nozzles - aerosol spray of liquid - Subject rotates on turntable - Inside absorbent suit checked for penetration - Pass or Fail according to test criteria

Three types of fabric are used to make all Type 5 & 6 garments on the market.

- Flashspun Polyethylene (FSPE)
- SMS - Spunbond-Meltblown-Spunbond **Lakeland SafeGard™**
- Microporous Film Laminate (MPFL) **Lakeland MicroMax®**

All Type 5 & 6 garments on the market are one of these or variations of these.

How do these fabrics compare? Three important factors can be considered:

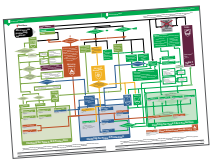
Liquid Protection	Type 6 CE testing includes liquid repellency and penetration tests against four chemicals. In two of the four chemicals, Lakeland MicroMax® options achieve superior results than the closest alternative.	CE testing for Infectious Agents to EN 14126 includes tests against four types of contamination. In all four tests MicroMax® options achieve superior results and the highest class compared to the FSPE alternative, which is unclassified in the critical ISO 16604 test. *(see page 21)*
Physical Properties	Testing as part of CE certification allows comparison of strength properties: abrasion - tensile strength - trapezoidal tear etc. In comparisons of the three fabric types Lakeland SafeGard™ or MicroMax® options offer a superior choice compared to the alternative FSPE option in most cases.	
Comfort and Breathability	Comfort is primarily a result of air permeability.	
	Independent testing indicates the difference between MicroMax® and FSPE is minimal and close to zero. Both have very low air permeability. The Lakeland SafeGard™ option has an air permeability over 10 times that of the alternatives and is the superior choice for a comfortable garment.	A common sense approach and simple 'home' tests clearly confirm both the low air-permeability of MicroMax® and FSPE and the superior air-permeability of SafeGard™. **Where protection AND comfort are required, Lakeland Cool Suit® options provide the best of both MicroMax® and SafeGard™ fabrics and may be the best choice available.** *(See pages 25-28)*

Type 5 and 6 garments can be selected on the basis of a combination of three factors:

1. Protection
2. Physical Properties
3. Comfort and Breathability

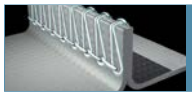
For all three factors - Lakeland garments provide the best choice ....

See Lakeland's '**Guide to Type 5 & 6 Coverall Selection**' for more detailed information on Type 5 & 6 garment comparison.



See centre pages for a flow chart guide to selection of chemical suits.

SafeGard ™ GP



Serged (stitched) overlocked seams

TYPE 5 | TYPE 6 | EN 1073-2 | EN 1149-5

Entry level SMS based hazardous dust (Type 5) and liquid aerosol (Type 6) protective coverall with high comfort level.

- 55gsm SMS fabric with high breathability and superior level of comfort.
- Air permeability over 10 times that of flash-spun polyethylene or microporous film laminates.
- Air permeability negates generation of the bellows effect which on low-breathable fabrics encourage penetration of particles through seams and closures *(see page 18)*
- Available in white and blue.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	3
Flex Cracking	ISO 7854	6
Trapezoidal Tear	ISO 9073	2
Tensile Strength	EN 13934	3
Puncture Resistance	EN 863	1
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Burst Strength	EN 13938	2
Seam Strength	EN 13935	3

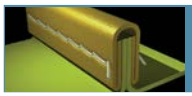
Styles available: 528, L528, 414, L414, 101, 101Z, 527, 024, 020, 022, 022NS, 022ANS

For more information, see page 13

Available in: White, Blue

For penetration and repellency against liquids see individual product data sheets.

SafeGard ™ 76



Stitched & Bound Seams

TYPE 5 | TYPE 6 | EN 1073-2 | EN 1149-5

Breathable SMMS fabric with stitched and bound seams for superior comfort and protection.

- Constructed with 55gsm 4-layer SMMS fabric – double layer of melt-blown fibre ("MM") to enhance hazardous dust protection whilst maintaining high comfort level.
- Seams are exterior stitched and bound with coated fabric to improve strength and particle filtration.
- Fabric air-permeability is over 10 times greater than flash-spun polyethylene and microporous film laminated resulting in much higher comfort level for users.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	6
Flex Cracking	ISO 7854	6
Trapezoidal Tear	ISO 9073	2
Tensile Strength	EN 13934	2
Puncture Resistance	EN 863	1
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Seam Strength	EN 13935	3

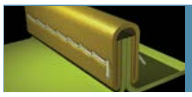
Styles available: 428, L428, 414, L414

For more information, see page 13

Available in: White, Navy Blue, Orange

For penetration and repellency against liquids see individual product data sheets.

SafeGard ™ 76 Diamant



TYPE 5 | TYPE 6 | EN 1073-2 | EN 1149-5

SafeGard™ 76 version with SMMS fabric and red bound seams. Specifically developed to meet the French Asbestos Industry regulations.

- Constructed with 55gsm 4-layer SMMS fabric - double layer of melt-blown fibre ("MM") to enhance hazardous dust protection whilst maintaining high comfort level.
- Seams are exterior stitched and bound in red with coated fabric to improve strength and particle filtration.
- Fabric air-permeability is over 10 times greater than flash-spun polyethylene and microporous film laminated resulting in much higher comfort level for users.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	6
Flex Cracking	ISO 7854	6
Trapezoidal Tear	ISO 9073	3/2
Tensile Strength	EN 13934	2/1
Puncture Resistance	EN 863	1
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Burst Strength	EN 13938	3
Seam Strength	EN 13935	3

Styles available: 428

For more information, see page 13

Available in: White (with red seams)

SUPER B-STYLE

For penetration and repellency against liquids see individual product data sheets.

Consider the 'Bellows Effect'

The best coverall for dust protection may not be what you think!

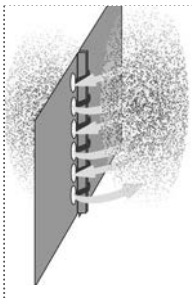
The 'Bellows Effect' occurs when a user wears a coverall constructed with fabric that has very low air permeability. As the wearer moves during activity, air is forced to move around inside the suit (walking is very much like the pumping action of bellows), creating constant pressure changes and short term pressure differentials between the inside and outside of the suit.

Differences in air pressure result in air flows, so air will flow both in and out of the suit using any route available. In a non-permeable fabric the only route is through stitch holes in seams and any other openings such as zip teeth, neckline and cuffs etc.

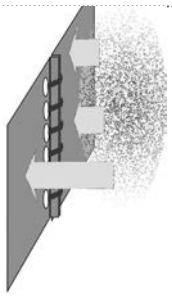
Thus dust particles are actively drawn into the garment.

For this reason a coverall with air-permeable fabric such as SafeGard™, may be a better choice for dust protection than other fabrics that have low air permeability.

However, when a user wears a suit made from fabric with good particle filtration of particles yet also with good air permeability the 'bellows effect' does not occur; the air can pass through the material so no airflows are created through seam holes.



Non-air-permeable fabric - airflow created through seam holes and dust drawn through seam.



Air permeable fabric (such as SafeGard™): air passes through fabric; no airflow through seam holes; dust particles filtered by fabric.

See Lakeland's '**Guide to Type 5 & 6 Coverall Selection**' for more detailed information on Type 5 & 6 garment comparison.

MicroMax® NS

Serged (stitched) overlocked seams

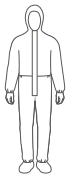
TYPE 5-B | TYPE 6-B | EN 1073-2 | EN 1149-5 | EN 14126

MicroMax® NS NUCLEAR
A version of MicroMax® NS developed for the Nuclear Industry. Features a clear window in the chest for viewing of a docimeter or other monitoring device.
Fully tested and approved to Nuclear Industry Standard EN 1073 as well as Type 5 & 6 and EN 1149.

High quality microporous film laminate fabric provides superior liquid resistance against liquids, light oils and light sprays of liquid chemicals.

- Soft and flexible high quality microporous film laminate offers excellent combination of protection and comfort.
- High moisture vapour transmission rate allows escape of vapour to maintain comfort.
- Fabric passes all tests in EN 14126 infectious agent standard at the highest class. Certified to Type 5-b and Type 6-b.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	3
Flex Cracking	ISO 7854	6
Trapezoidal Tear	ISO 9073	3/2
Tensile Strength	EN 13934	2/1
Puncture Resistance	EN 863	1
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Burst Strength	EN 13938	2
Seam Strength	EN 13935	3*



Styles available: 428, L428, 414, L414, 412, 101, 024, 020, 022, 022NS, 022ANS, 023NS

For more information, see page 13

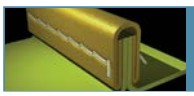
Available in: White Orange

SUPER B-STYLE

For penetration and repellency against liquids see individual product data sheets.

Warning: whilst the MicroMax® NS fabric is tested against penetration of infectious agents and certified to EN 14126, we do not recommend garments with stitched seams to be used against biological hazards. Sealed seam garments, such as MicroMax® TS *(see page 20)* should be used.

MicroMax®



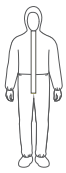
Stitched & Bound Seams

TYPE 5-B | TYPE 6-B | EN 1073-2 | EN 1149-5 | EN 14126 * fabric only

Unique microporous film laminate with 'rip-stop' scrim between layers for added strength and durability.

- Addition of unique scrim results in highest tear strength in its class – tougher and more durable for more demanding environments.
- Stitched and bound exterior seams to enhance strength and particle filtration at seams.
- Soft and flexible high quality microporous film laminate offers excellent combination of protection and comfort.
- High moisture vapour transmission rate allows escape of vapour to maintain comfort.
- Fabric passes all tests in EN 14126 infectious agent standard at the highest class. Certified to Type 5-b and Type 6-b.
- Non-linting film surface combined with taped seams makes MicroMax® ideal for many clean room applications.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	2
Flex Cracking	ISO 7854	6
Trapezoidal Tear	ISO 9073	3/2
Tensile Strength	EN 13934	1
Puncture Resistance	EN 863	1
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Seam Strength	EN 13935	3



Styles available: 428, L428, 414, L414

For more information, see page 13

Available in: White

SUPER B-STYLE

For penetration and repellency against liquids see individual product data sheets.

Warning: whilst the MicroMax® fabric is tested against penetration of infectious agents and certified to EN 14126, we do not recommend garments with stitched seams to be used against biological hazards. Sealed seam garments, such as MicroMax® TS *(see page 20)* should be used.

MicroMax® NS Trine

TYPE 5 | TYPE 6 | EN 1149-5

Type 5 & 6 protective coverall with rear sleeve for harness lanyard.

- Allows harness and lanyard to be worn inside coverall.
- Protects harness and lanyard from damaging liquids, paints and chemicals - reduces costs.
- Lanyard sleeve folds away neatly in rear pouch when not in use.
- Velcro fastened lanyard sleeve for easy fitting.
- Tested at SATRA fall-arrest rig: garment remains intact when a fall incident occurs, maintaining protection for wearer.

Physical Properties
See MicroMax® NS

Styles available: EMN428WH
For more information, see page 13

Available in: White

SUPER B-STYLE

For penetration & repellency against liquids see individual product data sheets.

Use the QR link to watch the video of the testing at SATRA.

www.lakeland.com/europe/blog/cat/videos/post/mmnstrine/

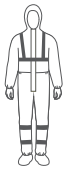
SATRA TECHNOLOGY

MicroMax® NS Hi-viz

TYPE 5-B | TYPE 6-B | EN 1073-2 | EN 1149-5 | EN 14126

MicroMax® NS version with reflective tape for superior visibility

- Biomotion tape configuration with X-back design.
- Certified to Type 5 (dust including asbestos) & Type 6 (liquid aerosol spray), EN 1073 for radiation contaminated dusts, and EN 14126 for infectious agent protection*
- Compliant to AS/NZS 4602.1:2011 Class N Night Use Only, AS/NZS 1906.4.2010 Reflectivity of Materials (Tape only).
- Passes 60 minutes ASTM Penetration Test on 100% Concentration Diazinon, Motor-Oil 40wt, Household Bleach, Isocyanate-based paints, 50% concentration on Sodium Hydroxide and 10% Sodium Hypochlorite
- Suitable for wear during night and low light operations within road traffic, mining, waste water, security site operations above and below ground.
- Anti-static to EU standard EN 1149-5
- Certified in Australia as UPF 35: very good sun protection - so ideal for outdoor work where wearers in warm environments are wearing shorts and t-shirts underneath.



Styles available:
EMN428RT - White
EMN428ORT - Orange
For more information, see page 13

SUPER B-STYLE

Available in: White Orange

For penetration & repellency against liquids see individual product data sheets.

Physical Properties
See MicroMax® NS

MicroMax® TS

TYPE 4-B | TYPE 5-B | TYPE 6-B | EN 1073-2 | EN 1149-5 | EN 14126

Microporous film laminate fabric with stitched and taped seams for enhanced Type 4 protection

- Addition of taped seams to MicroMax® NS coverall – lightweight and flexible coverall for heavier Type 4 sprays of liquids.
- Fabric passes all tests in the EN 14126 infectious agent standard. Added taped seams makes MicroMax® TS suitable for many medical, pharmaceutical and biological applications.
- Soft and flexible high quality microporous film laminate offers excellent combination of protection and comfort.
- High moisture vapour transmission rate allows escape of vapour to maintain comfort.

Physical Properties

Property	EN Standard	CE Class
Abrasion Resistance	EN 530	3
Flex Cracking	ISO 7854	6
Trapezoidal Tear	ISO 9073	3/2
Tensile Strength	EN 13934	2/1
Puncture Resistance	EN 863	1
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Seam Strength	EN 13935	3

Styles available: 428, L428, 414, L414, 412, 101, 024, 020, 022, 022NS, 022ANS, 023NS
For more information, see page 13

Available in: White

SUPER B-STYLE

For penetration and repellency against liquids see individual product data sheets.

Understanding EN 14126 infectious agent protection

Protection against infectious agents is a vital issue - not only in medical applications such as in hospitals and accident attendance - but also in emergency response projects such as the Ebola relief effort during the major outbreak in 2014-15.

EN 14126

Garments for protection against bacteria, biological contaminants and infectious agents feature this pictogram on the label.

They will also be labelled using the appropriate chemical protection 'Type' with suffix letter 'B' as below:

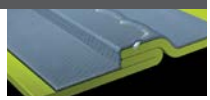
Type 3-B

Type 4-B

Type 5-B

Type 6-B

Construction and Seam Requirements



EN 14126 makes no other seam or construction requirements beyond those standard in the different garment types - Type 3, Type 6 etc.

However, we would recommend that all garments for use in applications involving biological or infectious agents should be **at least** Type 4 and be constructed with sealed seams to ensure no penetration can occur through the stitch holes that are inevitable with any stitched seam garment. This might be critical in applications involving highly dangerous viruses such as Ebola.

The importance of donning and doffing

Donning and especially doffing of a suit is vital in all chemical protective applications - but especially so in infectious agent protection.

When operatives emerge from a critical area they cannot yet relax. The outside of the garment may be contaminated with infected liquids and great care must be taken not to touch any infected area; gloves must be the last to be removed and garments should ideally be removed by a suitably protected colleague, 'peeling' from the top down so any contamination on the outside ends up on the inside of the removed suit bundle.

We recommend a written donning and doffing procedure following a risk assessment with training for operatives. You can see a video of a donning and doffing procedure on the Lakeland website - **www.lakeland.com**

Application Example	Critical Test within EN 14126
Emergency Relief effort for Ebola Outbreak - Front line medical staff	With a highly dangerous bacteria transmitted in blood and body fluids it is critical to select a garment that achieves a high class in ISO 16604 test.
Hospital Cleaning staff - involved in cleaning contaminated surfaces and equipment.	Subject to the biological hazard, a high class in the ISO 22610 test might be appropriate.

EN 14126 contains four relevant, classified tests *(and not five as some claim)*

Five tests are listed, but the first (ISO 16603) is purely used to indicate a starting point for conducting the 'real' test for protection against infected blood and body fluids, ISO 16604.

The classification table for this relates ONLY to the ISO 16604 test; there is NO CLASSIFICATION for EN 16603 and claiming such classification is meaningless; it is not a test that indicates any proof of protection.

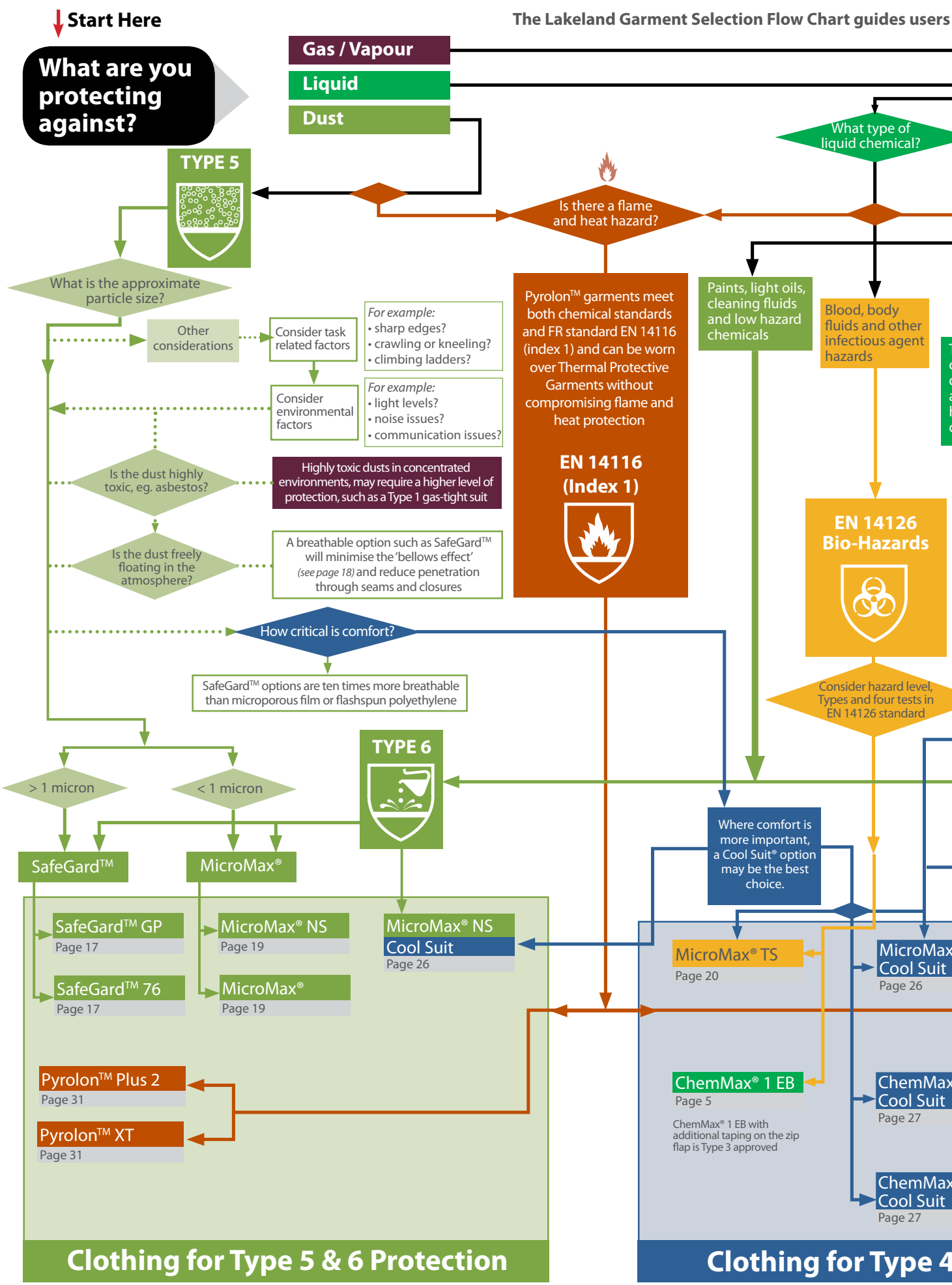
Tests listed in EN 14126

Standard	Description	Classes	Comments
ISO/ FDIS 16603	Screening test for ISO 16604 test	None	Uses synthetic blood to indicate the pressure at which strike-through is likely to occur in preparation for The ISO/FDIS 16604 test. **This test does not indicate any level of protection.**
ISO/ FDIS 16604	Protection against blood and body fluids	1 to 6 (6 is highest)	Uses a bacteriophage to measure the pressure at which a body fluid such as blood will penetrate through the fabric. Class 6 is equivalent to passing the test under a pressure of 20kPa.
ISO/ DIS 22610	Protection against mechanical contact with contaminated surfaces	1 to 6 (6 is highest)	Measures the protection against mechanical contact with contaminated surfaces by a light mechanical rubbing of the fabric. Class 6 corresponds to no penetration after 75 minutes.
ISO/ DIS 22611	Protection against biologically contaminated aerosols	1 to 3 (3 is highest)	Measures protection against penetration by a contaminated aerosol spray. Level 3 corresponds with a penetration of less than 0.001%.
ISO/ DIS 22612	Protection against contaminated solid particles	1 to 3 (3 is highest)	Measures penetration of particles by dusting a fabric sample held on a vibrating plate with a small amount of contaminated powder. Class 3 is the equivalent of less than 10 particles penetrating.

The above four tests (excluding the first listed which is not an indicative test) indicate a garment fabric's effectiveness in resisting penetration of bacterial contaminants in various hazard types - contaminated blood, contaminated particles, aerosols etc - giving a classification for each of 1 to 6 or 1 to 3.

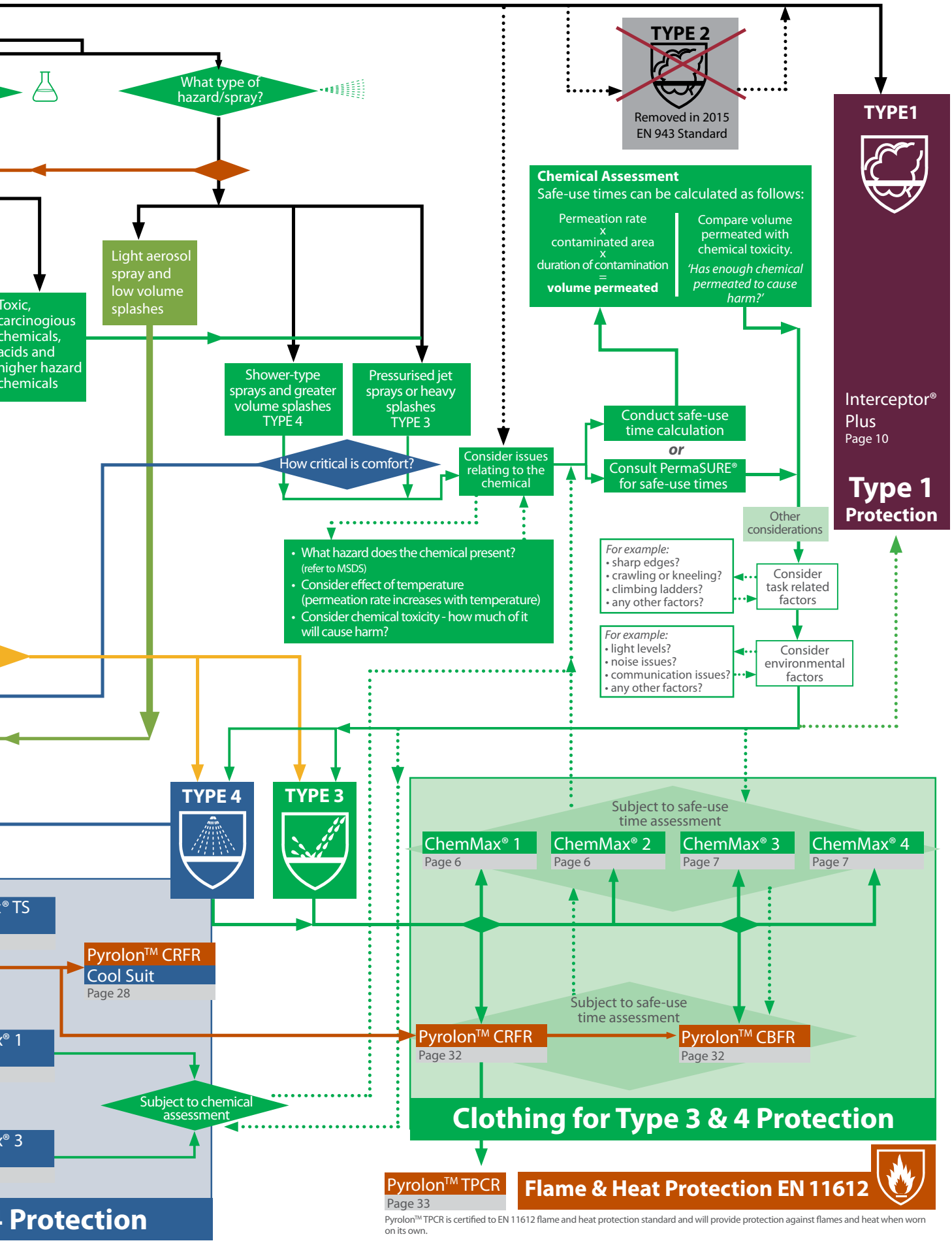
For users, it is important not just to confirm a garment is certified to EN 14126, but also to assess the classification of different tests according to the requirements of their specific application - such as in the examples shown:-

The Lakeland Garment Selection Flow Chart guides users



Selection of the best garment for the job involves consideration of more than whether protective clothing is certified to the correct standard, but should include consideration of wider issues that may not be specifically dealt with by standards.

through the questions and issues that should be considered in selecting the best garment for the job.



The Lakeland Garment Selection Flow Chart is for Guidance only and provides no guarantee that a garment is suitable for any specific application. It is always the final responsibility of the user to ensure a garment is suitable for the applications.

Applications and Certification chart

Which garments are suitable for which applications and standards?

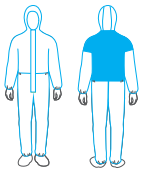
⚠ ChemMax® 1EB achieves Type 3 only with the zip flap securely taped up. Whilst the MicroMax® and MicroMax® NS fabrics are tested to EN 14126 we do not recommend garments with stitched seams for this type of protection.

			Chemical Protection						Type 5 & 6 Protection						Type 4 Protection and Cool Suits®							Chemical Protection with FR					Aluminised heat protection			ARC Protection	
			TomTex®	ChemMax® 1	ChemMax® 2	ChemMax® 3	ChemMax® 4 Plus	Interceptor® Plus	SafeGard® GP	SafeGard® 76	SafeGard® 76 Diamant	MicroMax® NS	MicroMax®	MicroMax® NS Trine	ChemMax® 1 EB	MicroMax® TS	MicroMax® NS Cool Suit	MicroMax® TS Cool Suit	ChemMax® 1 Cool Suit	ChemMax® 3 Cool Suit	Pyrolon™ CRFR Cool Suit	Pyrolon™ Plus 2	Pyrolon™ XT	Pyrolon™ CRFR	Pyrolon™ CBFR	Pyrolon™ TPCR	ALM® 300	ALM® 500	ALM® 700	ARC® 43	ARC®-X
Hazardous Chemical Protection																																
Gas and Vapour Protection	Type 1	EN 943						✓																								
Gas & Vapour Protection - Positive Pressure Suits	*Type 2*	*Now deleted*																														
Liquid Chemicals: Jet Spray Protection	Type 3	EN 14605	✓	✓	✓	✓	✓	✓							⚠									✓	✓	✓						
Liquid Chemicals: (Shower-Type) Spray Protection	Type 4	EN 14605	✓	✓	✓	✓	✓	✓							✓	✓		✓	✓	✓	✓			✓	✓	✓						
Hazardous Dust Protection	Type 5	EN 13982	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
Liquid Chemicals : Aerosol Spray Protection	Type 6	EN 13034	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						✓
Nuclear Industry: Protection against Radiation Contaminated Particles		EN 1073-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
Flame and Heat Protection																																
Limted Flame Spread		EN 14116																				✓	✓	✓	✓	✓						✓
Heat & Flame Protection		EN 11612																							✓	✓	✓	✓	✓	✓	✓	✓
Limited Flame Spread - Procedure A	Code A1	ISO 15025																							✓	✓	✓	✓	✓	✓	✓	✓
Limited Flame Spread - Procedure B	Code A2	ISO 15025																								✓	✓	✓	✓	✓	✓	✓
Heat Resistance - Convective Heat (Class 1-3)	B (1-3)	ISO 9151																								B1	B1	B1	B3	B2	B1
Heat Resistance - Radiant Heat	C (1-4)	ISO 6942(B)																							C1	C1	C4	C4	C4	C1	C1
Heat Resistance - Molten Aluminium Splash	D (1-3)	ISO 9185																								D1	D1	D3			
Heat Resistance - Molten Iron Splash	E (1-3)	ISO 9185																								E1	E1	E1			E3
Heat Resistance - Contact Heat	F (1-3)	ISO 12127-1																								F1	F1	F1	F3		F1
Welding and Allied Processes		EN 11611																								✓	✓	✓			✓
Arc Flash Heat Protection - Box Method	Class 1-2	EN 61482-1-2																								1				2	2
Arc Flash Heat Protection - Open Arc	ATPV	EN 61482-1-1																								21.9				43	16
Protection against Infectious Agents		EN 14126		✓	✓	✓	✓	✓				⚠	⚠	✓	✓	✓	Cool Suits® not recommended for Infectious agent protection															
Resistance against Contaminated Liquids Under Pressure	Class 1-6	ISO 16604		6	6	6	6	6				6	6	6	6	6																
Resistance against Liquids due to Mechanical Contact with Contaminated Surfaces	Class 1-6	EN 14126-A		3	3	3	3	3				3	3	3	3	3																
Resistance to Contaminated Aerosols	Class 1-3	ISO 22611		3	3	3	3	3				3	3	3	3	3																
Resistance to Contaminated Solid Particles	Class 1-3	ISO 22621		6	6	6	6	6				6	6	6	6	6																
Anti-Static Clothing-Surface Resistance (<2.5x10⁹ohms)		EN 1149-1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓						
Anti-Static Clothing - Charge Decay		EN1149-3																							✓							✓
Hi-Visibility Garments		EN 20471																														✓
Protection against Rain		EN 343																														✓
Seam Type																																
Serged (Overlock Stitch)									✓			✓		✓								✓	✓				✓	✓	✓	✓	
Stitched and Bound										✓	✓		✓				✓														
Stitched and Taped (Outer Side)			✓	✓	✓	✓	✓								✓	✓		✓	✓	✓	✓			✓	✓	✓					✓
Stitched and Taped (Both Sides)								✓																								

Introduction: The Cool Suit® Principle - Breathable Protection

What is a Cool Suit®?

- What makes a protective coverall comfortable?
- How do Cool Suits® work?
- What Cool Suit® variations are available?



What makes a protective coverall comfortable?	The primary influence on comfort is air-permeability - *the tendency to allow air to circulate in and out of the suit*	The only truly breathable fabric for Type 3, 4, 5 and 6 coveralls is SMS - *primarily suitable for dust and light or low level liquid splash protection.*	Claimed Moisture Vapour Transmission Rate(MVTR) is not air-permeability or true breathability and has only a very limited effect on comfort. *Comfort needs air-permeability*	Fabrics with an effective barrier cannot also feature high air permeability. *You can have an effective barrier or high air permeability... but not both*	Lakeland Cool Suits are a coverall design which combines high breathability fabrics with high-protection fabrics for Type 4, 5 and 6 protection.

How do Cool Suits® work?

The critical protection areas - the **torso** front, the **legs**, the **arms** and **hood** use Lakeland's effective range of protective fabrics, depending on protection type.

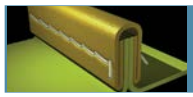
The 'Bellows Effect', the movement of air inside the suit created by movement helps pump air in and out of the suit through the breathable panel.

Type 4 Cool Suit Protection: Most chemical protective applications are Type 4 and NOT Type 3. Distinguishing between the two can have benefits in terms of comfort and cost.
See Lakeland 'Guide to Chemical Suit Selection' for more info.

What Cool Suits® options are available?

Type 5 & 6 Protection		Type 4 Chemical Protection			Type 4 Chemical Protection with FR
MicroMax® NS Cool Suit *(page 26)*	MicroMax® NS Cool Suit Auto *(page 26)*	MicroMax® TS Cool Suit *(page 26)*	ChemMax® 1 Cool Suit *(page 27)*	ChemMax® 3 Cool Suit *(page 27)*	Pyrolon™ CRFR Cool Suit *(page 28)*

MicroMax® NS Cool Suit



MicroMax NS Cool Suit® 'Auto' option

The Cool Suit® 'Auto' version is designed for the automotive industry and features a more extensive rear breathable panel.

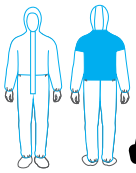
Available with panel in blue, red or orange.

Microporous film laminate Type 5 & 6 protective coverall with breathable rear panel & bound seams.

- Superior quality MicroMax® NS microporous film laminated fabric: excellent barrier to light splashes and sprays of liquids covering critical parts of the body.
- Effective barrier against hazardous dusts.
- Breathable SafeGard™ GP rear panel offers air permeability of 43 cubic feet per minute for wearer comfort.
- Bound seams offers additional protection against dust and liquid ingress and superior strength and durability… effective and cost effective.
- Breathable coverall – reduces the 'bellows effect' *(see page 18)*– the tendency to create 'sucking' of air and dust particles in through seam holes, cuffs, ankles and zip.
- Combination of blue and white offers distinctive coverall for visibility.

Physical Properties

Property	EN Standard	CE Class
Abrasion Resistance	EN 530	3
Flex Cracking	ISO 7854	6
Trapezoidal Tear	ISO 9073	3/2
Tensile Strength	EN 13934	2/1
Puncture Resistance	EN 863	1
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Burst Strength	EN 13938	2
Seam Strength	EN 13935	3
Results refer to main body fabric		



Styles available: C428

For more information, see page 13

Available in: White (with blue seams and rear panel)

SUPER B-STYLE by Lakeland

For chemical penetration and permeation test results.
See Chemical Suit Selection Guide

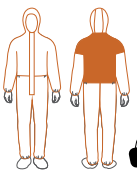
MicroMax® TS Cool Suit

Microporous film laminate coverall with taped seams and covered breathable rear panel.

- MicroMax® TS version of the Cool Suit for enhanced, lightweight Type 4 comfort.
- Breathable and comfortable Type 4 protection.
- Critical garment areas – the torso front, arms, legs and hood use MicroMax® NS fabric and taped seams for superior protection
- Rear breathable panel is covered by a flap of MicroMax® NS fabric - sealed at top and sides.
- Lower panel edge left open to allow circulations of air inside and out
- White with orange rear panel and taped seams for easy identification.

Physical Properties

Property	EN Standard	CE Class
Abrasion Resistance	EN 530	3
Flex Cracking	ISO 7854	6
Trapezoidal Tear	ISO 9073	3/2
Tensile Strength	EN 13934	2/1
Puncture Resistance	EN 863	1
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Seam Strength	EN 13935	3
Results refer to main body fabric		



Styles available: C428

For more information, see page 13

Available in: White (with orange seams and rear panel)

SUPER B-STYLE by Lakeland

For chemical penetration and permeation test results.
See Chemical Suit Selection Guide

ChemMax® 1 Cool Suit

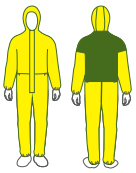
The ChemMax® 1 Cool Suit uses the unique Type 4 Cool Suit® design with Lakeland's lightweight and flexible ChemMax® 1 chemical suit fabric to produce a chemical splash suit that features improved comfort over standards chemical suits.

- ChemMax® 1 coverall with a breathable rear panel covered by a ChemMax® 1 flap sealed at top and sides and with an open overlapped flap at the bottom to allow free circulation of air inside and outside the suit.
- Yellow fabric with green seams and rear panel for easy identification
- The 'bellows effect' *(see page 18)* assists in ensuring effective circulation of air.
- Stitched and taped seams for effective protection.
- Fabric is light and flexible to improve comfort further.
- Suitable for protection against a broad range of hazardous chemicals in applications with Type 4 splashes and sprays*

Physical Properties

Property	EN Standard	CE Class
Abrasion Resistance	EN 530	2
Flex Cracking	ISO 7854	1
Trapezoidal Tear	ISO 9073	4/3
Tensile Strength	EN 13934	2
Puncture Resistance	EN 863	2
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Seam Strength	EN 13935	Class 4
Burst Resistance	EN 13938-1	2

Results refer to main body fabric. For properties of breathable panel see SafeGard® GP information.



Styles available: C428

For more information, see page 13

Available in: Yellow
(with green seams and rear panel)

For chemical permeation test results:
See Chemical Suit Selection Guide

** Note : ChemMax® Cool Suits are for Type 4 applications only. The covered breathable rear panel has a much lower chemical barrier than the main body fabric and so the garment should not be used in any application where there is a possibility of a chemical being sprayed or splashed under the rear flap.*

ChemMax® 3 Cool Suit

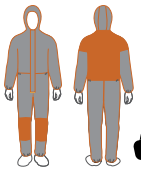
The ChemMax® 3 Cool Suit uses the unique Type 4 Cool Suit® design using Lakeland superior protection ChemMax® 3 chemical suit fabric to produce a high barrier chemical splash suit that features improved comfort over standard chemical suits.

- ChemMax® 3 coverall with a breathable rear panel covered by a ChemMax® 3 flap sealed at top and sides and with an open overlapped flap at the bottom to allow free circulation of air inside and outside the suit.
- ChemMax® 3 fabric works with the PermaSURE® app for easy calculation of real-world safe use times *(see page 14-15)*
- Grey fabric with orange seams and knee pads and rear panel for easy identification.
- The 'bellows effect' *(see page 18)* assists in ensuring effective circulation of air.
- Stitched and taped seams for effective protection.
- Multi-layer coextruded polymer fabric for superior chemical barrier and a smooth and flexible finish with no 'pinched' bond points.
- Suitable for protection against a broad range of hazardous chemicals in applications with Type 4 splashes and sprays*

Physical Properties

Property	EN Standard	CE Class
Abrasion Resistance	EN 530	6
Flex Cracking	ISO 7854	4
Trapezoidal Tear	ISO 9073	4
Tensile Strength	EN 13934	3
Puncture Resistance	EN 863	2
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Seam Strength	EN 13935	4

Results refer to main body fabric. For properties of breathable panel see SafeGard® GP information.



Styles available: C428

For more information, see page 13

Available in: Grey
(with orange seams and rear panel)

For chemical permeation test results:
See Chemical Suit Selection Guide

** Note : ChemMax® Cool Suits are for Type 4 applications only. The covered breathable rear panel has a much lower chemical barrier than the main body fabric and so the garment should not be used in any application where there is a possibility of a chemical being sprayed or splashed under the rear flap.*

Pyrolon™ CRFR Cool Suit

TYPE 4 | TYPE 5 | TYPE 6 | EN 1073-2 | EN 1149-5 | EN 14116 INDEX 1

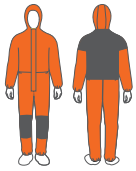
The Pyrolon™ CRFR Cool Suit combines the FR properties of Pyrolon™ with the innovative and comfortable Type 4 Cool Suit design and chemical protection of the Pyrolon™ CRFR. A chemical suit certifed to FR standard EN 14116-Index 1... the fabric will not ignite and burn.

- Pyrolon™ CRFR coverall with a breathable rear panel of Pyrolon™ Plus 2 *(see page 31)* covered by a Pyrolon™ CRFR flap sealed at top and sides and with an open overlapped flap at the bottom to allow free circulation of air inside and outside the suit.
- Orange fabric with grey seams, rear flap and kneepads for easy identification
- The 'bellows' effect *(see page 18)* assists in ensuring effective circulation of air.
- Stitched and taped seams for effective protection.
- Fabric is soft, light and flexible to improve comfort further.
- Suitable for protection against a broad range of hazardous chemicals in applications with Type 4 splashes and sprays*
- Intrinsic anti-static properties with low surface resistance that do not wear off with use - so combined with FR properties Pyrolon™ CRFR is an excellent choice for applications in explosive atmospheres or where contact with flame is a possible hazard.

Physical Properties

Property	EN Standard	CE Class
Abrasion Resistance	EN 530	6
Flex Cracking	ISO 7854	5
Trapezoidal Tear	ISO 9073	2
Tensile Strength	EN 13934	3
Puncture Resistance	EN 863	2
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Burst Strength	EN 13938	2
Seam Strength	EN 13935	4

*Applies to main body only. For properties of breathable panel see Pyrolon Plus 2 information. * Note : The Pyrolon CRFR Cool Suits is for Type 4 applications only. The covered breathable rear panel has a much lower chemical barrier than the main body fabric and so the garment should not be used in any application where there is a possibility of a chemical being sprayed or splashed under the rear flap.*



Styles available: C428

For more information, see page 13

Available in: Orange
(with grey seams and rear panel)

SUPER B-STYLE

For chemical permeation test results:
See Chemical Suit Selection Guide

Understanding Anti-Static in Limited Life Coveralls

Disposable coveralls are commonly marked with the anti-static pictogram to indicate that the garment is 'anti-static'. But what does this actually mean? Does it guarantee the garment meets the specific requirements of your application?

What does 'anti-static' mean?
Static is electricity that builds on surfaces as a natural consequence of movement and friction. Synthetic materials, such as the thermoplastics commonly used to make disposable clothing, are particularly disposed to this. Fabric will develop a static charge which will always try to move towards an opposite charge such as the earth and will seek the quickest route to get there. In some cases, should the charge build sufficiently, it will "jump" across a space to an oppositely charged surface in the form of a spark.

If this happens in an environment with flammable fumes, vapours or dust, it could ignite the explosive atmosphere. The purpose of "anti-static" clothing is to avoid – or at least reduce the probability – of this happening.

What does 'anti-static to EN 1149' mean?
EN 1149 is the CE standard that defines and classifies anti-static clothing. It consists of 5 parts. The first three of these are test standards to measure anti-static properties. Part 5 details garment requirements, so clothing is certified to EN 1149-5, having been tested to at least one of the other parts..

Part 5 states that protective clothing should meet requirements measured either in:

- Part 1 (Surface Resistance – the tendency to allow a charge to dissipate across its surface)
  or
- Part 3 (Charge Decay - the tendency to allow a charge to decay from a point on it's surface)

EN 1149-5

The majority of single-use protective clothing is tested according to Part 1: Surface Resistance. *1

The requirements if tested to Part 1 are that the fabric should have a maximum surface resistance of 2.5 x 10^9 Ohms ('Ohms' being a measurement of electrical resistance) when tested after being pre-conditioned for 24 hrs at a temperature of 23(+/- 1)°C and a relative humidity of 25(+/-5)%.

So the anti-static pictogram on a garment tells you only that one sample of the fabric, on one occasion, under laboratory test conditions and with the specified pre-conditioning, showed a surface resistance of less than 2.5 x 10^9 Ohms. It tells you nothing more and nothing less.

Why is the requirement set at a maximum of 2.5 x 10^9 ohms?
This is a very good question; why is this level of surface resistance the "cut-off" point? It suggests that a surface resistance above this will result in an incendiary spark, and one below this will not.

There is some uncertainty over the origin of this figure. However, given the variety of circumstances and environments that might occur, it seems unlikely that the dividing line between "spark or no spark" could be as clear or simple as this. More likely this is a question of probabilities; at some point it has been determined that this is a suitable cut-off point that reduces the likelihood of a static spark sufficiently for most normal circumstances. *2

Understanding Anti-Static in Limited Life Coveralls

How is this achieved?
The property of a material to conduct electricity (i.e. allow it to travel through or across it) is its "conductivity". The opposite (i.e. its tendency to RESIST) is its "resistance" or "resistivity". The purpose of clothing being "anti-static" is to reduce its resistance so that any electrical charge that develops can dissipate through or across the material and to earth harmlessly, without jumping to another surface and without an incendiary spark.

In woven fabrics the usual method is to include threads of a conductive fibre such as carbon in the weave. Any charge then readily travels along this conductive fibre. This can normally be seen as a dark coloured grid in such fabrics. However this would be too difficult and/or costly to do in disposable nonwoven fabrics and films so a different method has been developed.

Water is highly conductive. Thus a chemical treatment that is moisture absorbent is applied to the whole surface of the fabric at the manufacturing stage. When the garment is in use this absorbs moisture from the atmosphere, holding a thin film on the surface. This film is conductive and so allows a charge to readily "dissipate" and, provided it has a route, go to earth harmlessly.

Why the pre-conditioning?
The requirement for pre-conditioning of the fabric at a relative humidity of 25% is important. 25% is a very low humidity – unusually low – that only rarely occurs naturally. In the majority of locations globally, humidity is likely to be in excess of 50% and probably closer to 100%. Given that the anti-static treatment relies on absorbing moisture from the atmosphere, the implication is that in most cases the treatment will be much more effective than in the test (because in most cases more moisture is available) so surface resistance will be much lower than indicated by the test. In other words, there is a wide safety margin built into the standard.

What does this mean in the real world? What practical steps can be taken to better manage anti-static and explosive atmosphere risks?

Three issues are critical in assessing the consequences for users of chemical suit that are "anti-static:-

a. Garment 'anti-static' relies on surface resistance and allowing a charge to go to earth harmlessly

However, in order for it to 'go to earth' it needs a route to get there and users must consider how this is ensured:-

i. One of the best routes is through the human body (we are mostly made of water) but this relies on the surface of the coverall being constantly in contact with the wearer's skin – perhaps at the wrists or ankle.
ii. It also relies on the assumption that neither the wearer's footwear nor the floor is insulating; either would prevent the charge going anywhere.
iii. Alternatively, choose a garment with attached socks which, when worn over the wearers normal footwear will ensure the fabric remains in constant contact with the floor (again, assuming the floor is not insulated!)
iv. Finally, if feasible, in some cases it may be appropriate to maintain a conducting cable with one end clipped to the coverall and the other to a known grounding point.

b. The required level of anti-static of a fabric (i.e. its surface resistance) is achieved through a topical treatment on the fabric surface

The topical treatment is essentially a weak surfactant or detergent that is moisture absorbent. However, any topical treatment will fade, wear or rub off over time. So if anti-static properties are critical, management of the process and use might be important:-

i. Limit the time that coveralls are used. If use time is long, consider more regular changing to a new suit, especially if the application involves higher than normal abrasion of the suit or rubbing on other surfaces
ii. Avoid continuing use of damaged suits; leaving aside the fact that a damaged suit is not protecting the wearer, an electrical charge cannot jump across a tear
iii. Do not re-use suits and definitely never wash and re-use them. Washing will remove the anti-static treatment.
iv. There is little known evidence of how long anti-static treatments last on stored coveralls. However, good practice would suggest avoiding use of older coveralls on which the treatment may have faded, and choose garments packed in sealed bags rather than ones that merely have tape at the bag opening. Also do not un-pack garments until they are to be worn.

c. The EN 1149-1 test is conducted under laboratory conditions generally more stringent than the real world

The fact that fabric is pre-conditioned at a relative humidity of 25% means that generally garments will actually be used in humidity's much higher than this. So in most cases the surface resistance will be lower (i.e. the anti-static properties "better") than indicated by the test. However, if anti-static is critical in an application there are practical steps that users can take to minimise risk:-

i. Consider monitoring humidity in the work area. Clearly if humidity is very low the risk is higher so avoidance of particular tasks might be appropriate where possible
ii. If possible, in indoor work areas, during dry spells or in dry areas, consider using humidifiers to ensure the humidity is maintained at a high level. This ensures the anti-static treatment has more moisture available to work more effectively.

Finally… Don't use Standard Disposables!!!
In areas where explosion is a high risk, and given the uncertain nature of anti-static properties of disposable coveralls, the wise choice might be to not use this type of standard coveralls but to choose a more specialist option:-

i. Pyrolon™ coveralls *(see pages 30 to 33)* offer protection through Types 3 to 6, are flame retardant to EN 14116 (Index 1) AND because of the unique fabric construction, have intrinsic anti-static properties and generally low Surface Resistance.
ii. In extreme cases consider using specialist anti-static clothing that uses woven fabric with carbon fibre thread to maintain high conductivity and low resistance.

Conclusion
Anti-static properties and requirements of disposable coveralls is a confusing and difficult area. Perhaps more than most areas of PPE this is a case of minimising risk rather than guaranteeing protection. However, with greater understanding there are practical steps that can be taken in the selection and use of garments along with the management of the task and work area, that ensure risk is kept to a minimum.

Notes

*1 Part 2 is a test to measure "vertical resistance" – the tendency to allow a charge to pass THROUGH the fabric. Part 4 is intended to be a test method for whole garments but this has not been successfully established at the time of publication.

*2 It is notable that several other local standards, such as the UK DSEAR regulation (derived from the European ATEX directives) and the German standard BGR 132 relating to equipment for use in explosive atmospheres, whilst not specifically relating to protective clothing both indicate that EN 1149-5 is the best indicator of garment suitability. In the case of BGR 132 it also defines a surface resistance that is less stringent than EN 1149-5. In addition the US has a similar test method, but the preconditioning is done at a relative humidity of 50%, making it "easier" to achieve a pass. This suggests that EN 1149-5 is the most stringent and "best" assessment in use.

Introduction: Why Use Pyrolon™ ?

Many applications require **both** thermal protection **and** chemical protection. How do you safely provide both?

- Why is wearing standard chemical suits over thermal protective garments a hazard?
- How do FR standards EN 14116 and EN 11612 standards differ?
- What is Thermal Mannequin Testing and how do different garment types perform?

Why is wearing standard chemical suits over thermal protective garments a hazard?

Currently users often wear a Thermal Protective Garment (TPG) certified to EN 11612 for flame/heat protection and wear a standard chemical suit OVER it for the required liquid or dust protection.

This creates a HAZARD!

Why?

Standard disposable suit fabrics are based on polypropylene/polyethylene and in contact with flames will ignite and burn

Being thermoplastic they melt and drip, adhering to the TPG fabric below, transferring heat energy to the skin beneath and to other surfaces, thus potentially spreading the fire.	In a flash fire situation this will dramatically increase the heat energy contacting the skin and thus the incidence of body burn.	Even in the case of contact with a small flame, a standard chemical suit fabric may ignite and cause burns.

Wearing a standard disposable suit over a TPG can dramatically compromise thermal protection.

How do FR standards EN 14116 and EN 11612 standards differ?

EN 11612

EN 11612 is the standard for measuring PROTECTION against different types of heat; convective, radiant, contact etc *(see page 38)*.

EN ISO 14116 INDEX 1/0/0

EN 14116 does not indicate any PROTECTION against flames or heat but is to indicate a fabric's flammability - the tendency to ignite and burn in contact with flame.

For Flame & Heat Protection a Thermal Protective Garment (TPG) certified to EN 11612 should be worn.

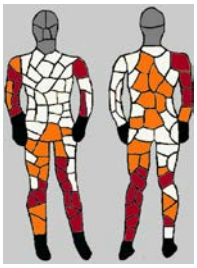
EN 14116 Index 1 garments can be worn over a TPG without compromising protection.

Lakeland Pyrolon™ garments use a unique viscose based fabric which will not ignite and are certified to EN 14116,

However, Pyrolon™ TPCR is certified to EN 11612 and, can REPLACE a standard EN 11612 TPG and provides chemical protection to Type 3 & 4.

What is Thermal Mannequin Testing and how do different garment types perform?

Thermal Mannequin Testing provides a method of assessing the effectiveness of heat protective workwear by using a thermal mannequin (a mannequin covered in heat sensors) and simulating flash fires.



This test produces a body map showing Predicted 2nd and 3rd degree burns and so indicates how effectively a garment protects the wearer.

The table indicates how different Type 3 & 4 and Type 5 & 6 suits perform in this test when worn **over** a Thermal Protective Garment.

Type 3 & 4 coverall tests	TPG with Standard Chemical Suit **PBB = 53% including 3rd degree burns**	TPG with Pyrolon™ CRFR Coverall **PBB = 24% NO 3rd degree burns**
Tests show Pyrolon™ CRFR results in a much lower incidence of body burn than with standard chemical suits.		

Type 5 & 6 coverall tests	TPG with FSPE coverall **PBB = 23.9% including 3rd degree burns**	TPG with Standard SMS Coverall **PBB = 20.5% including 3rd degree burns**	TPG with FR SMS Coverall **PBB = 19.6% including 3rd degree burns**	TPG with Pyrolon™ XT coverall **PBB = 8.2% NO 3rd degree burns**	TPG with Pyrolon™ Plus 2 coverall **PBB = 7.4% NO 3rd degree burns**
Tests show Pyrolon™ Type 5 & 6 coveralls result in a much lower incidence of body burn than with standard chemical suits. Note: there is almost no difference in performance between a standard SMS and an FR SMS. **PBB = predicted body burn**					

Pyrolon™ garments provide a range of protection

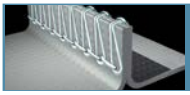
	Pyrolon™ Plus 2	Pyrolon™ XT	Pyrolon™ CRFR	Pyrolon™ CBFR	Pyrolon™ Cool Suit	Pyrolon™ TPCR
EN 14116	✓ Index 1	✓ Index 1	✓ Index 1	✓ Index 3	✓ Index 1	✓ Index 1
Type 6	✓	✓	✓	✓		
Type 5	✓	✓				
EN 1073	✓	✓				
Type 4			✓	✓	✓	
Type 3			✓	✓		
EN 11612						✓
EN 1149-5	✓	✓	✓	✓	✓	✓

EN 1149-5

Superior Anti-Static Properties

Pyrolon™ garments also feature intrinsic anti-static properties which unlike standard chemical suits do not rub off or erode with time - *see page 29*

Pyrolon™ Plus 2



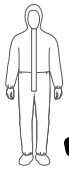
Serged (stitched) overlocked seams

TYPE 5 | TYPE 6 | EN 1073-2 | EN 1149-5 | EN 14116 INDEX 1

Flame retardant Type 5 & 6 breathable coverall.

- Pyrolon™ garments meet the requirements of EN 14116 (Index 1) garments for protection against flames and heat.
- Fabric will not ignite, chars at low temperature and unlike standard disposables does not continue burning after the ignition source is withdrawn.
- Can safely be used over thermal protective garments without compromising thermal protection.
- Note that Pyrolon™ Plus 2 fabric will not ignite but is designed to be worn OVER thermal protective garments and will not provide heat protection if worn alone.
- Intrinsic anti-static properties with very low surface resistance; anti-static does not wear off in use like standard disposables.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	3
Flex Cracking	ISO 7854	6
Trapezoidal Tear	ISO 9073	2
Tensile Strength	EN 13934	2/1
Puncture Resistance	EN 863	2
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Burst Strength	EN 13938	3
Seam Strength	EN 13935	2



Styles available: 428

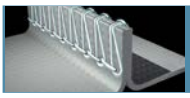
For more information, see page 13

Available in: White

SUPER B-STYLE

For penetration and repellency against liquids see individual product data sheets.

Pyrolon™ XT



Serged (stitched) overlocked seams

TYPE 5 | TYPE 6 | EN 1073-2 | EN 1149-5 | EN 14116 INDEX 1

Flame retardant Type 5 & 6 breathable coverall.

- Pyrolon™ garments meet the requirements of EN 14116 (Index 1) for garments for protection against flames and heat.
- Includes laminated rip-stop scrim which improves strength and durability..
- Fabric will not ignite, chars at low temperature and unlike standard disposables does not continue burning after the ignition source is withdrawn.
- Can safely be used over thermal protective garments without compromising thermal protection.
- Note that Pyrolon™ XT fabric will not ignite but is designed to wear OVER thermal protective garments and will not provide heat protection if worn alone.
- Intrinsic anti-static properties with very low surface resistance; anti-static does not wear off in use like standard disposables.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	2
Flex Cracking	ISO 7854	6
Trapezoidal Tear	ISO 9073	4/3
Tensile Strength	EN 13934	3/2
Puncture Resistance	EN 863	2
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Burst Strength	EN 13938	2
Seam Strength	EN 13935	2

Styles available: 428, 101, 514, 016, 019, 022NS, 023NS

For more information, see page 13

Available in: Pale Blue

SUPER B-STYLE

For penetration and repellency against liquids see individual product data sheets.

Pyrolon™ CRFR

Pyrolon® CRFR - a chemical repellent and flame retardant coverall

- Combines Flame Retardency to EN 14116 with Type 3 & 4 chemical protection (approximately equivalent to ChemMax® 1).
- Outer FR PVC barrier film laminated to proprietary non-woven substrate of viscose rayon.
- Fabric will not ignite or burn: chars at temperature lower than its ignition point.
- Exceptionally soft and flexible fabric for superior comfort.
- Can be worn over woven FR garments without compromising flame and heat protection.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	6
Flex Cracking	ISO 7854	5
Trapezoidal Tear	ISO 9073	3/2
Tensile Strength	EN 13934	3
Puncture Resistance	EN 863	2
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Burst Strength	EN 13938	2
Seam Strength	EN 13935	4

Styles available: 428, 101, 514, 016, 019, 022NS, 023NS

For more information, see page 13

Available in: Orange Grey

For chemical permeation test results:
See Chemical Suit Selection Guide

Pyrolon™ CBFR

High barrier Type 3 & 4 chemical suit combined with FR properties to EN 14116 – Index 3.

- Coverall with high level chemical barrier for protection against a wide range of hazardous chemicals.
- Certified as primary FR workwear to EN 11612 (A1/C1) - will provide protection against heat and flame without wearing an FR garment underneath.
- Meets the requirements of FR standard EN 14116 – to Index 3 (as tested according to EN 15025 - not Index 1 as other FR disposables). Note that Index 3 is the same requirements as detailed for FR garments in EN 11612 for thermal protective garments.
- Single zip and double storm flap front fastening with hook & loop seals enabling re-use where appropriate (chemical suits should ONLY be re-used if uncontaminated and undamaged. Decision on re-use is the users' responsibility).
- Coverall with hood, elasticated cuffs, waist and ankles. Double layer, cushioned kneepads for comfort and durability. Version with attached feet available.

Physical Properties		
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	6
Flex Cracking	ISO 7854	3
Trapezoidal Tear	ISO 9073	3
Tensile Strength	EN 13934	3
Puncture Resistance	EN 863	2
Anti-static (charge decay) *	EN 1149-3	SF=0.1/HDT=0.24s)
Seam Strength	EN 13935	4

* Anti-static tested according to EN 1149-3 (Charge decay). Requirements in EN 1149-5 are: SF (Shielding Factor) >0.2 *or* Half Decay Time < 4s, so HDT of 0.24s is well within the requirement

Styles available: 4228, 214

For more information, see page 13

Available in: Dark Blue

For chemical permeation test results:
See separate datasheet

Pyrolon™ TPCR

Lakeland Pyrolon™ TPCR offers users a unique combination of protection against multiple risks in a single, limited life coverall.

- FR chemical Barrier film laminated to FR base - 330gsm.
- 'Blanket' base fabric offers good FR and high level arc protection.
- Fabric does not ignite in FR tests.
- Achieves Arc Thermal Protective Value of 21.9 cal/m^2 - HRC Class 2
  - compared with typical values for FR woven fabrics:-
  - 330gsm FR cotton: 13 cal/m^2 - HRC Class 2.
  - 200gsm meta-aramid: 7.1 cal/m^2 - HRC Class 1.
- Melting point of 232°C - will resist splashes of hot liquids.
- Single coverall for protection covers multiple risks:
  - Flame and heat protection to EN 11612 - A1/A2.
  - Chemical splash and spray protection to Types 3 & 4 (EN 14605)
  - Passed all heat resistance tests - EN Class 1 in all tests : Convective, radiant and contact heat + molten aluminium and iron splash similar to most FR woven fabrics.
  - Protection against thermal hazards of electric arc… class 1 (4kA) in EN 61482-1-2
  - Arc Thermal Protective Value (ATPV) according to ASTM 1959 test = 21.9 cal/m^2
  - Protection for welding and allied process to EN 11611.
- Soft and flexible fabric for enhanced comfort.
- Fabric is tough and durable. Can be used more than once if uncontaminated and un-damaged. Decision on re-use is the users' responsibility.
- Replace FR garments in dirty or physically demanding areas to reduce costs of replacement and laundering.
- Lakeland Super-B style: coverall with elasticated hood, cuffs, ankles and waist. Double zip / storm flap front.

Pyrolon™ TPCR Style

Style code 428
Coverall with elasticated hood, cuffs, waist & ankles.
Double front zip fastening.

Sizes: S - XXXL

Available in: Orange with grey seams

Physical Properties

		Pyrolon® TPCR
Property	**EN Standard**	**CE Class**
Abrasion Resistance	EN 530	2
Flex Cracking	ISO 7854	4
Trapezoidal Tear	ISO 9073	4
Tensile Strength	EN 13934	2
Puncture Resistance	EN 863	2
Anti-Static (Surface Resistance)	EN 1149-1	<2.5 x 10^9 ohms
Seam Strength	EN 13935	5

Permeation and Penetration Test Results

Pyrolon® TPCR uses the same barrier film as Pyrolon® CRFR so test results are the same for both. Testing has been conducted to three test variations.

Chemical	CAS No.	Permeation time to rate: 0.1ug/min/cm^2	Permeation time to rate: 1.0ug/min/cm^2	Penetration visible breakthrough ASTM F903
Acetone	67-64-1	12	NT	>60
Acetonitrile 90%	70-05-8	Imm	NT	>60
Carbon Disulphide	75-15-0	9	NT	>60
Dichloromethane	75-09-2	Imm	NT	2
Diethylamine	209-89-7	Imm	NT	>60
Ethyl Acetate	141-78-6	16	NT	>60
n-Hexane	110-54-3	>480	NT	>60
Methanol	67-56-1	Imm	NT	>60
Sodium Hydroxide (40%)	1310-73-2	6	>480	>60
Sulphuric Acid (96%)	7664-93-9	38	19	45
Tetrahydrafurane	109-99-9	<1	NT	<1
Toluene	95-47-6	6	NT	>60

Note: ASTM F903 is a "breakthrough" barrier test rather than a permeation test. It records the time until a visible amount of the chemical breaches the fabric and so deals with a larger volume than a permeation test. Whilst this type of test is not currently recognised in Europe it still provides useful information for users in some circumstances.

Note:
The primary purpose of Pyrolon™ CRFR & TPCR garments is to combine flame retardant properties with chemical protection and they are intended for use in areas where contact with flame and heat is the primary risk but where some chemical protection is required.

The barrier film used on Pyrolon™ garments is a proprietory FR film that has a reasonable barrier to penetration by many chemicals. However, in many cases it may not have a high resistance to permeation by chemicals.

For this reason the US ASTM F903 penetration test, which records time until a visible amount of the chemical penetrates the fabric rather than recording a time to a specific permeation rate has been used to indicate levels of protection. Where high permeation resistance is required against chemicals with high toxicity a higher barrier chemical suit may be required.

Selection of the most appropriate chemical suit for a task is always the responsibility of the user and should only be made by qualified personnel following a suitable risk assessment.

The Importance of Garment Design and Super-B Style

Protective clothing is used in a wide variety of environments, situations and applications throughout a range of industries. Each one is different and each places garments under a unique set of stresses, strains and physical demands.

Yet most chemical protective clothing is made from polymers and non-woven materials which whilst having the benefit of being inexpensive, feature strength properties that are generally lower than their woven counterparts. So good design is vital in ensuring garments are built to cope with the various physical demands that might be placed on them.

Similarly, whilst comfort is primarily defined by the air permeability of the fabric, even a garment that is breathable will be uncomfortable if it is too tight, restricts movement or is poorly designed.

So effective ergonomic design is important in both maintaining the comfort of the wearer and in ensuring a garment lasts as long as required by the job.

SUPER B-STYLE by Lakeland

Lakeland 'Super-B' Style

Lakeland CE garments use a specific ergonomically styled pattern that features a unique combination of three key factors, along with other helpful design elements.

1 Three-piece hood with shaped centre-piece

Some cheaper garments feature a simple 2-piece hood. Such hoods do not fit the head properly, restrict head movement and generally have a poor fit to respirator masks.

Lakeland garments not only feature a 3-piece hood which creates a more 3-D fit and resolves these problems, in addition the centre piece is a 'pointed oval' shape resulting in an even better fitting hood.

2 Two-piece crotch gusset

The crotch is invariably the point where garments split first, partly because this is where most stress is apparent, and partly because on cheaper garments it is the point where four seams – two body and two leg - meet at one point.

Lakeland garments feature an inserted crotch gusset of two dart-shaped fabric pieces. This creates a more shaped body which spreads the stress and allows greater freedom of movement.

3 Inset Sleeves

Most garments use the traditional 'bat-wing' style sleeve, in which the body forms a diagonal between the elbow and the waist. This is cheaper to produce as it uses less fabric, but it also restricts movement when a user reaches up. It also explains why some garments need thumb loops – because it results in pulling back of the sleeve and cuff.

Lakeland garments use the more expensive inset sleeve in which the body and arm follows the shape of the body. This allows greater freedom when reaching up and results in much less pulling back of the sleeve – so no thumb loops are required.

** Many Lakeland garments are available in versions with thumb-loops where they are required for other reasons.*

4 Cushioned Knee-Pads

ChemMax® garments and some Cool Suits® feature double-layer cushioned knee-pads which add comfort and durability in applications where crawling or kneeling is required.

5 Double zip and storm flap

ChemMax® garments feature a double zip with handy ring-pulls and double storm flap front fastening for superior protection.

6 Higher neck line

For improved neck protection and better respirator mask fit.

7 CE Chest Label

Lakeland CE coveralls feature a chest label containing all the legally required marking for CE certification, so users and supervisors can easily identify the correct garment is being worn.

8 Push-Lock® glove connection system

All Lakeland chemical suits feature cuffs designed to work with the Push-Lock® glove connection system *(see page 9)* which provides a fully sealed, Type 3 tested connection with most chemical gloves.

Introduction: ALM® Aluminised Heat Protective Clothing

What is aluminised clothing?

- What is aluminised clothing designed to do?
- How does aluminised clothing work?
- How can you assess radiant heat protection?

What is aluminised clothing designed to do?

Aluminised clothing is designed to protect against the hazard of RADIANT heat for approach or proximity work during maintenance or working close to high temperature heat sources such as industrial ovens and furnaces.

Whilst aluminised suits may have testing indicating some protection level against other forms of heat, such as molten drops and contact heat, they are not specifically designed for such protection. Further, they will offer only limited protection against ambient or convective heat.

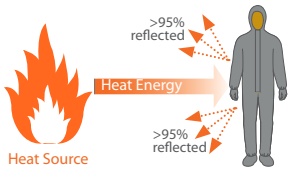
Lakeland ALM® garments are also certified to the EN 11611 welding applications standard.

Unless specifically stated aluminised garments are NOT designed for fire entry.

Lakeland's ALM radiant heat protective clothing provides a range of protection levels with or without a moisture barrier.

How does aluminised clothing work?

Aluminised clothing works by reflecting heat energy away from the wearer.



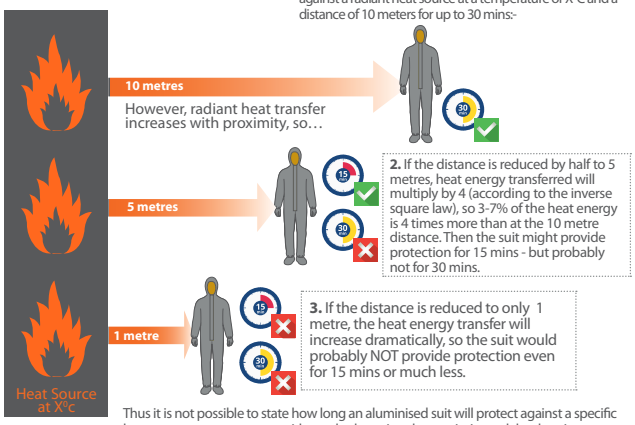
Aluminium has a radiant heat reflective co-efficient of 93-97%.

Lakeland ALM® fabrics use a 100% Aluminium 'Dual-Mirror®' surface so up to 95% of radiant heat energy is reflected.

How can you assess radiant heat protection?

Some manufacturers claim their suits are suitable for protection against radiant heat sources up to X°C. However:-

1. Given heat reflectivity of Aluminium is 93-97%, some heat energy (3-7%) will transfer through the fabric to the wearer. So if we assume a suit will provide sufficient protection against a radiant heat source at a temperature of X°C and a distance of 10 meters for up to 30 mins:-



2. If the distance is reduced by half to 5 metres, heat energy transferred will multiply by 4 (according to the inverse square law), so 3-7% of the heat energy is 4 times more than at the 10 metre distance. Then the suit might provide protection for 15 mins - but probably not for 30 mins.

3. If the distance is reduced to only 1 metre, the heat energy transfer will increase dramatically, so the suit would probably NOT provide protection even for 15 mins or much less.

Thus it is not possible to state how long an aluminised suit will protect against a specific heat source or temperature without also knowing the proximity and the duration.

However, standard CE resistance tests provide a method of assessing the comparative performance of heat protective materials. (see page 38)

ALM® 300

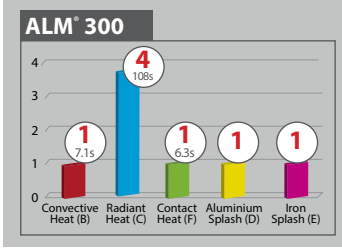
EN 11612 EN 11611

Entry level aluminised suit for essential high temperature approach applications

- Outer surface of superior Gentex 'Dual Mirror®' 100% aluminimum.
- Reflects up to 95% of radiant heat energy so less heat penetrates through to the wearer, extending effective work periods.
- Hood includes gold reflective heat shield.
- Class 4 (highest class) protection against radiant heat.
- Available as full suit with jacket & pants or full coverall with hood, boots, glove and carry bag
- Also available as individual items when required*
- Jacket and coverall include rear pouch for BA set
- Range of accessory styles available such as sleeves, aprons and smocks

* For full EN 11612 protection the full suit including hood, gloves and boots should be worn as an ensemble

Heat Performance Classes and Results



See page 38 for heat test and classification explanations

Fabric: Single layer of Gentex Dual Mirror® reflective aluminised fibre glass

Styles available: 20, 20BA, 22, 22BA, 30, 10, 10BA, 44, 55, ARBAG, 55, 25, 26, 300BAE, 300E

For more information, see page 37

ALM® 500

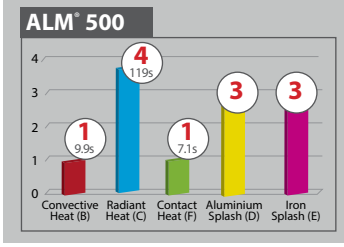
EN 11612 EN 11611

Aluminised suit with moisture barrier for use in approach areas with moisture or steam

- Outer surface of superior Gentex 'Dual Mirror®', 100% aluminimum.
- Reflects up to 95% of radiant heat energy so less heat penetrates through to the wearer, extending effective work periods
- Inner neoprene moisture barrier for moisture and steam protection
- Hood includes gold reflective heat shield
- Class 4 (highest class) protection against radiant heat
- Available as full suit with jacket & pants or full coverall with hood, boots, glove and carry bag
- Also available as individual items when required*
- Jacket and coverall include rear pouch for BA set
- Range of accessory styles available such as sleeves, aprons and smocks

* For full EN 11612 protection the full suit including hood, gloves and boots should be worn as an ensemble

Heat Performance Classes and Results



See page 38 for heat test and classification explanations

Fabric: Outer layer of Gentex Dual Mirror® aluminised fibreglass with inner neoprene moisture barrier

Styles available: 20, 20BA, 22, 22BA, 30, 10, 10BA, 44, 55, ARBAG, 55, 25, 26, 500BAE, 500E

For more information, see page 37

ALM® 700

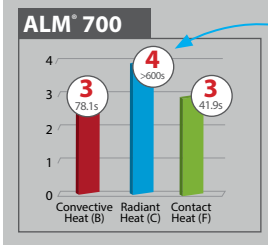
EN 11612 EN 11611

Triple layer aluminised suit with moisture barrier and additional fibreglass thermal barrier for superior heat protection

- Outer surface of superior Gentex 'Dual Mirror®' 100% aluminimum, inner neoprene moisture barrier.
- Additional middle layer of thick fibreglass padding for higher level heat protection.
- Surface reflects up to 95% of radiant heat energy so less heat penetrates through to the wearer, extending effective work periods.
- Hood includes gold reflective heat shield.
- Class 4 (highest class) protection against radiant heat. Note: the actual result is >600s. The threshold for class 4 is 95s, so the ALM® 700 is well above this.
- Class 3 protection for convective and contact heat.
- Available as full suit with jacket & pants or full coverall with hood, boots, glove and carry bag
- Also available as individual items when required*
- Jacket and coverall include rear pouch for BA set
- Range of accessory styles available such as sleeves, aprons and smocks

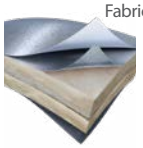
* For full EN 11612 protection the full suit including hood, gloves and boots should be worn as an ensemble

Heat Performance Classes and Results



NB. Radiant heat result is >600s - well beyond the Class 4 threshold of 95s.

See page 38 for heat test and classification explanations



Fabric: Outer layer of Gentex Dual Mirror® aluminised fibreglass, inner neoprene moisture barrier with fibreglass aluminimum thermal barrier between.

Styles available: 20, 20BA, 22, 22BA, 30, 10, 10BA, 44, 55, ARBAG, 55, 25, 26, 700BAE, 700E

For more information, see page 37

ALM® Accessories and Styles

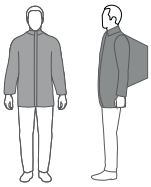
ALM® 300, 500 and 700 can be purchased in full sets including jacket & pants or coverall with or without BA accommodation, pants with braces, hood, gloves, boots and carry bag, or items and other accessories can be purchase separately.

Individual style codes are shown below; style codes are preceded by 3, 5 or 7 to denote ALM® 300, 500 or 700.

For example:

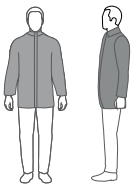
3	20BA	XL
ALM® 300	Jacket with BA accommodation	Size XL

Coveralls, Jackets and Pants



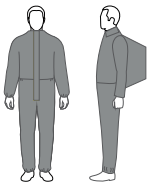
20 BA

Jacket with collar with BA accommodation.
Size: S - XXXL



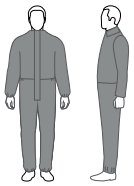
20

Jacket with collar without BA accommodation.
Size: S - XXXL



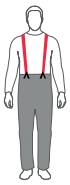
22BA

Coverall with collar with BA accommodation.
Size: S - XXXL



22

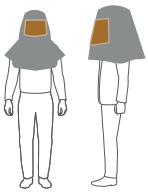
Coverall with collar without BA accommodation.
Size: S - XXXL



30

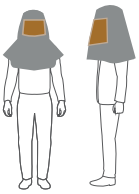
Pants with braces.
Size: S - XXXL

Accessories



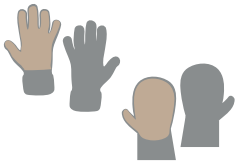
10 BA

Hood with gold plated visor with BA accommodation.
Size: S - XXXL



10

Hood with gold plated visor without BA accommodation.
Size: S - XXXL



44

Gloves with leather palms (ALM® 300/500)

Mitts with leather palms (ALM® 700)
Size: M - XL

55

Boots with leather soles.
Size: One size

ARBAG

Storage / carry bag for ALM suits.

Other Styles

36

Sleeves with elastic ends
Size: One size

25

Long apron/smock with rear entry
Size: One size

26

Long jacket
Size: One size

Full Suits

Range	Code	Description
ALM® 300	300BAE	Jacket and pants or coverall with BA accommodation, hood, gloves, boots and carry case
	300E	Jacket and pants or coverall without BA accommodation, hood, gloves, boots and carry case
ALM® 500	500BAE	Jacket and pants or coverall with BA accommodation, hood, gloves, boots and carry case
	500E	Jacket and pants or coverall without BA accommodation, hood, gloves, boots and carry case
ALM® 700	700BAE	Jacket and pants or coverall with BA accommodation, hood, gloves, boots and carry case
	700E	Jacket and pants or coverall without BA accommodation, hood, gloves, boots and carry case

Warning: ALM® garments will only provide full body protection to EN 11612 and the radiant heat levels tested when worn with all the items to provide full body protection.

Understanding EN 11612 And Radiant Heat Protection

EN 11612
Protection against heat and flames

- What is the purpose of the standard?
- What are the different heat tests it contains and how are they tested?
- How is this useful in assessment of aluminium suits?

EN 11612
What is the purpose of the standard?

The EN 11612 introduction states it contains MINIMUM PERFORMANCE LEVELS for garments for protection against heat and flames and is not intended as a 'benchmark' - many applications will require higher levels of protection than the minimum.

What are the different heat tests it contains and how are they tested?

Fabric Flammability Tests

Test method	EN 15025 : Procedure A (Code letter A1)
Status	Required: applies to fabric and seams
Description	Flame applied to centre of vertical fabric sample for 10 seconds
Requirements	- No flame shall reach the sample edge - No flaming or molten debris - No hole formation > 5mm - Afterglow should be ≤ 2s - Afterflame should be ≤ 2s

Test method	EN 15025 : Procedure B (Code Letter A2)
Status	Optional - applies to fabric and seams
Description	Flame applied to bottom edge of vertical fabric sample
Requirements	- No flame shall reach top or vertical edges - No Flaming or molten debris - Afterglow should be ≤ 2s - Afterflame should be ≤ 2s

Fabric Heat Resistance Tests

Note: any ONE of the heat protection performance tests with a Class 1 result is required

Test Standard	Code Letter	Heat Type	Description	Classes
ISO 9151	B	Convective Heat	- Small flame applied to lower surface of horizontal fabric sample - Heat calorimeter records the time until a rise of 24°C on the other side of the fabric	B1: 4.0s to <10s B2: 10.0s to <20.0s B3: 20.0 or more
Lowest class is B1, highest class is B3: the longer time taken for temperature rise the longer a garment will protect				
ISO 6942	C	Radiant Heat	- Fabric sample exposed to radiant heat source of 20-40Kw - Heat calorimeter records the time until a rise of 24°C on the other side of the fabric	C1: 7.0s to <20.0s C2: 20.0s to <50.0s C3: 50.0s to <95.0s C4: 95.0s or more
Lowest class is C1, highest class is C4: the longer time taken for temperature rise the longer a garment will protect				
ISO 12127-1	F	Contact Heat	- Fabric sample placed over heated cylinder at 250°c - Calorimeter behind fabric measure time to a rise in temperature of 10°c	F1: 5s <10s F2: 10s <15s F3: 15s
F1 is the lowest. F3 is the highest. the longer time taken for temperature rise the longer a garment will protect				
Molten Metal Splash Tests				
Objective is to indicate the mass of molten metal required to damage a layer of PVC (simulating human skin) held behind the test fabric. The greater the mass required, the better the protection.				
ISO 9185	D	Molten Aluminium Splash	- Molten aluminium at 780°c dripped onto fabric sample at 60°c angle	D1: 100g <200g D2: 200g <350g D3: 350g
ISO 9185	E	Molten Iron Splash	- Molten iron at 1400°c dripped onto fabric sample at 75°c angle	E1: 60g <120g E2: 120g <200g E3: 200g
D1/E1 are the lowest. D3/E3 are the highest. The fabric will protect against a greater mass of the molten metal				

How is this useful in assessment of aluminised suits?

Aluminised suits are primarily designed to protect against RADIANT HEAT.

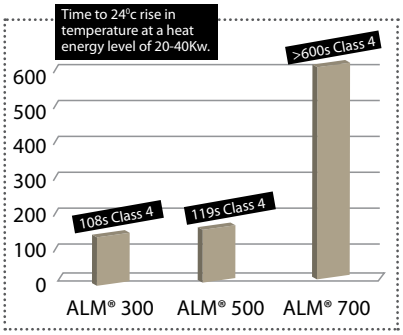
This is assessed as the temperature rise likely to cause pain from a 2nd degree burn at this heat energy level.

The ISO 6942 radiant heat test measures the time until a temperature rise of 24°C occurs behind the fabric given a heat source of 20 to 40Kw of radiant heat energy.

Class C1 7.0s to 20.0s	Class C2 20.0s to 50.0s	Class C3 50.0s to 95.0s	Class C4 95.0s or more

- Comparing the performance results of different products will indicate the relative effectiveness of protection.
- By calculating the likely heat energy level in Kw given the distance from the heat source, an approximate indication of how long wearer will be protected for can be determined.
- Where available, considering the actual result of the test as well the product classification can give more detail. Actual Results for Lakeland ALM® garments are indicated by the graph.

Note: Such an analysis can only provide approximate indications as other factors may effect the results - such as ambient temperature and the physiology of the wearer. It is always the users responsibility to determine suitability of a garment for an application



Although all 3 ALM® garments are measured as Class 4. ALM® 700 provides a much higher level of protection - and therefore facilitates greater working times and more protection, than 300/500.

Understanding Arc Flash Protection

EN 61482-1-1 & 2

- What is Arc Flash?
- What are hazards of Arc Flash?
- How do you select an Arc Flash protective garment?

1. What is Arc Flash?

Arc Flash occurs when an electrical charge jumps between two terminals or from a terminal to earth

Arc Flash incidents can occur in any industrial situation where a fault in a circuit occurs

2. What are the hazards of Arc Flash?

Arc Flash incidents present 3 hazard types

- **Intense Heat**
- **Explosive force with disintegrated projectiles**
- **Electrical Shock**

Studies suggest that 80% of Arc Flash incident fatalities occur as a result of burns from the intense heat generated.

Why?

In an instant an arc flash incident can generate enormous amounts of heat energy and temperatures of up to 35,000°C… that's roughly the temperature of the surface of the sun!

Arc Flash protective garments are primarily designed to protect against the heat hazard of electric arc and not the electrical shock or concussive force.

3. How do you select the correct Arc Flash garment?

There are three stages to selecting an arc flash garments

A. ASSESS	B. IDENTIFY	C. SELECT
Assess incident heat energy level	Identify appropriate Hazard Risk Category (HRC) or Arc Thermal Protective Value (ATPV) requirement	Select garment or garment combination with the correct minimum HRC or ATPV

A. ASSESS the incident heat energy level

The energy level released in an arc flash incident can be calculated according to the voltage in the circuit, the working distance from the terminal, the distance between the terminals and the related equipment class.

This should only be done by a qualified electrical engineer!

- Heat energy calculators are available on the internet
- US standard NFPA 70E identifies a method of calculating heat energy levels
- NFPA 70E also provides a list of standard tasks with associated heat energy levels and HRC

Heat energy levels are measured in Calories / cm^2

A 'Calorie' is a measurement of energy:
1 calorie is the energy required to
- raise the temperature of 1 gram of water
- through 1°C (defined as 4.1868 joules)

B. IDENTIFY the required ATPV or HRC

ATPV = Arc Thermal Protective Value

ATPV is the 'arc rating' - the identified heat energy level protection value of clothing designed for arc flash protection. Measured according to European test **EN 61482-1-1** OR **ASTM F1959.**

These tests measure the level of protection in cals/cm^2 based on 'the heat energy required to pass through the fabric resulting in 50% probability of a 2nd degree burn'

HRC = Hazard Risk Category

HRC is the identified classification of garments according to the ATPV measurement and defines four classes of garment:-

HRC 1	HRC 2	HRC 3	HRC 4
4	8	24	40
Hazard Risk Category (up to cals/cm^2)			

EN 61482-1-2 measures arc protection for low energy levels according to the 'arc-in-a-box' method. It identifies two classes of protection. This certification does NOT identify an ATPV and certified garments are suitable only for protection in low voltage situations.

EN 61482-1-2: Class 1 - Up to 4Ka

EN 61482-1-2: Class 2 - Up to 7Ka

C. SELECT Arc clothing with the minimum required HRC or APTV rating

Arc clothing should be labelled EITHER with an HRC classification or an ATPV rating.

EXAMPLE: If assessed Heat Energy Level in the incident is 23 cals/cm^2, the garments selected should be either:

HRC Class 3 (up to 24 cals/cm^2) OR An ATPV rating of AT LEAST 23 cals/cm^2

Layering of garments	Combinations of garments can be used to increase protection to the required level. Thus wearing 2 layers of clothing with an ATPV of 8 cals/cm^2 can be reasonably assumed to achieve an ATPV of at least 16 cals/cm^2.

Arc® 43

5 needle safety stitch seam

EN 11612 | EN 61482-1-1 | EN 61482-1-2

Triple layer of high-spec, superior, cellulose-based flame and heat protective fabric for high level Arc Flash heat protection.

- 3-layer fabric provides an Arc Thermal Protective Value of up to 43 cal/cm² *
- 3 layers of 240gsm European-made fabric: 48% modacrylic / 37% cellulosic / 15% para-aramid… 720gsm total weight
- Full suit consists of hood with arc visor, jacket, bib & brace pants with braces, gloves and boots
- Carry / storage case included
- Hood features 40 cal-rated arc visor, sealed with hook and loop fastening and hanging loop
- 81cm jacket features raglan sleeves for superior fit and freedom of movement
- Bib & Brace pants with swing pockets
- Hook and loop fastenings used throughout
- Seams are five needle safety stitch with FR/Aramid thread

* Note: Results for fabric: visor offers 40 cal/cm²

Flame, Heat and Arc Thermal Protective Performance

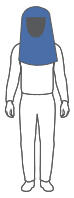
	Property	EN Standard	Result	CE Class
EN 11612	Flame Spread - Face Ignition	ISO 15020-2000	A1	-
	Heat Resistance	ISO 17492	Pass	Pass
	Convective Heat	ISO 9151:1995	5.2 sec	B1
	Radiant Heat	ISO 6942:2002	12.2 sec	C1
	Dimensional Change md/cd	ISO 5077:2000	-3% / -2.5%	Pass
EN 161482	Arc Protection - Box Method	EN 61482-1-2	7 Ka	2
	Arc Protection - ATPV	EN 61482-1-2	43 cal/cm²	2
	Arc Protection - HRC	NFPA 70E	HRC 4	-

Physical Properties

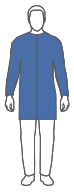
Property	EN Standard	Result	CE Class
Tensile Strength (N) - md	EN 13934-1:2013	970	Pass
Tensile Strength (N) - cd	EN 13934-1:2013	630	Pass
Trapeziodal Tear - md	ISO 13937-2	29	Pass
Trapeziodal Tear - cd	ISO 13937-2	26	Pass
Seam Strength (N)	EN 13935	355	Pass

Note: the above strength properties relate to testing on ONE layer of the ARC® 43 fabric only. The garment consists of an assembly of THREE layers of the fabric.

Arc® 43 Styles



AR43-HD-TSP18
Hood with arc rated removable tinted sealed visor (40 cals/cm²) with hook and loop fastening.
Size: One size



AR43-SC-TSP18
81cm coat with stand up collar, raglan sleeves -hook and loop fastening. No metal fastenings.
Size: S - XXXL

AR43-BO-TSP18
Bib and brace pants set with adjustable plastic buckles, teardrop style swing pockets, leg openings with velcro adjustments.No metal fastenings. **Size: S - XXXL**

AR43-G-TSP18
Gloves - 40cm length for full coverage
Size: One size

AR43-C-TSP18
Boot covers
Size: S - XXXL

AR43-R-DH
43 cal Arc Flash protection long coat/robe

ARBAG
Carry case for easy transport and storage

Pyrolon™ TPCR

Pyrolon™ TPCR is a multi-risk limited life coverall with excellent arc-flash protection properties.

As well as providing chemical protection to Types 3 & 4, flame and heat protection to EN 11612, welding process protection to EN 11611 and being anti-static it is also **certified to both Arc -Flash standards EN 61482-1-2 and EN 61482-1-1.**

It provides high level of protection measured at an ATPV of 21.9 cals/cm².

See page 33 for full details and specifications

Arc® X

Arc and FR Rated Rainwear - CE Certified Version

TYPE 6 | EN 343 | EN 20471 | EN 11612 | EN 61482-1-1 | EN 61482-1-2 | EN 11611 | EN 1149-5

Breathable hooded jacket & pants for outdoor arc-flash heat protection. With inherent FR properties, 16 cal ATPV and multiple hazard protection.

- 98% Polyester/2% carbon fibre laminated to MOD cotton knit fabric - weight 373gsm.
- Certified to all relevant standards including hi-vis, flame and heat protection, arc flash (both standards) and anti-static requirements
- Fold-away hood with drawstring – oversized to accommodate a hard hart
- Hook & loop adjustable wrists and ankles
- Adjustable braces with quick-release clasps
- Tough, front-zipper fastening with hook & loop secured storm flap
- Tested to the EN 17491-4 'Type 4' spray test to prove its effectiveness at keeping out rain showers
- Meets EN 343 Class 3:1 Water Penetration/ Water Vapour

Product Codes

Jacket – H-back design – Hi-vis orange	HVAJ01OR [Size]	Jacket – H-back design – Hi-vis yellow	HVAJ01Y [Size]
Jacket – X-back design – Hi-vis orange	HVAJ01ORX [Size]	Jacket – X-back design – Hi-vis yellow	HVAJ01YX [Size]
Bib & Brace Pants – Hi-vis orange	HVAP01OR [Size]	Bib & Brace Pants – Hi-vis yellow	HVAP01Y [Size]

Available in: Yellow, Orange

Physical Properties

Property	EN Standard	CE Class
Abrasion Resistance	EN 530	6
Tear Resistance	EN 9073-4	4
Tensile Strength	EN 13934-1	6
Puncture Resistance	EN 863	3

Penetration/Repellency EN 6529

Chemical	Penetration Class	Repellency Class
Sulphuric Acid 30%	3	3
Sodium Hydroxide 10%	3	3
O-Xylene	2	3
1-Butanol	3	3

Assessment of Predicted Body Burn according to EN 13506:2008

This test calculates predicted body burn according to an internationally recognised formula.

Underwear	Worn over 100% cotton long sleeved t-shirt and long johns		
Preconditioning	1 wash/ dry cycle at 40 °C		
Mean Heat Flux	84 kW/M2 (+/- 2.5%)		
Test 1 3 Second Burn Data acquisition time: 120 seconds	Pain - 14% 1st - 1.8% 2nd - 4.4% 3rd - 1.8% 2nd & 3rd - 6.2%	Test 2 4 Second Burn Data acquisition time: 120 seconds	Pain - 22.1% 1st - 2.7% 2nd - 8.0% 3rd - 5.3% 2nd & 3rd - 13.3%

Certification

AS/NZS 4602.1.2011	Class D/N Day or Night use
AS/NZS 1906.4.2010	Reflectivity of materials
ENA NENS 09	Meets designs & performance levels for national PPE guidelines for electrical arc hazards
EN ISO 13688:2013	Protective Clothing: General Requirements
EN ISO 20471:2013 + A1:2016	High Visibility Clothing (Jacket: Class 3 / Pants: Class 1)
RIS-3279-TOM:2016	High Visibility Requirements for High Visibility Clothing for UK railway use (orange only)
EN 61482-1-2:2007	Protection against the heat hazards of arc flash (Class 1 = 4 KA)
EN 61482-1-1:2009	Protection against the heat hazards of arc flash (ATPV = 16 cal/cm²)
EN 11612:2015	Protection against Flames and heat (A1; A2; B1; C1; E3; F1)
EN 11611:2015	Clothing for welding and related applications (Class 2 – A1 + A2)
EN 14116:2015	Protection against heat and flame: Flammability (Index 3)
EN 13034:2005+A1:2009	Protective clothing against hazardous chemicals – Type 6 protection against light aerosol sprays (also tested to the EN 17491-4 test for Type 4 garments)
EN 343:2003 +A1:2007/AC:2009	Protection against rain: water penetration and water vapour resistance
EN 1149-5:2008	Anti-Static Clothing (Tested to EN 1149-3: Charge Decay)

Arc® X

Arc and FR Rated Rainwear - Global Design

EN 11612 | EN 11611

Waterproof and windproof Arc and FR rated rainwear for effective and comfortable outdoor protection

- 280gsm PU/FR cotton composite fabric with high strength and flexibility
- Waterproof & windproof, yet breathable for maximum comfort
- Superior puncture, tear and abrasion resistance
- Resists staining by fuel, oil, diesel, grease and other petroleum-based products
- Effective resistance against mold and mildew odour build up
- Superior softness and flexibility for added comfort
- Reinforced welded/sealed seams providing excellent strength and durability
- Reinforced garment stress points - Lakeland's innovative DRP (Diamond Reinforcing Patch) reduces tearing at crotch
- ANSI certified for arc flash and flash fire protection

Certification

AS/NZS 4602.1.2011	Class D/N Day or Night use
AS/NZS 1906.4.2010	Reflectivity of materials
ASTM F-1891	Standard specification for Arc and Flame Resistant Rainwear
ENA NENS 09	Meets designs & performance levels for national PPE guidelines for electrical arc hazards
ASTM F 2733	Standard specification for workear for protection against flame hazards
ASTM F903	Meets standard method for resistance against penetration by liquids
NFPA 70E	Standard for electrical safety in the workplace

Physical Properties

Specification	AJPU/ABPU	AJPVC/ABPVC
Arc Rating - ATPV Cal/cm²	16.3	8.3
Ebtas Cal/cm²	21.9	43
Heat Attenuation Factor %	84	82
MVTR gms/24Hr	305	471
Total % Body Burn	12.3% (3rd Degree 6.55%)	13.66% (3rd Degree 6.28%)

Available in: Yellow, Orange

Product Codes

AJPU10LY	Hi-Vis Jacket with Hood - Yellow	ABPU10HOZ	Hi-Vis Bib & Brace Pants - Orange
AJPU10HO	Hi-Vis Jacket with Hood - Orange	APPU10LYZ	Hi-Vis Standard Pants - Yellow
ABPU10LYZ	Hi-Vis Bib & Brace Pants - Yellow		

CE OSX® Fire Fighters Clothing

EN 469

Key features include:
- Drag rescue device
- Kevlar® cuff with thumb loop
- Liner pocket
- Reinforced knees
- 8-point pant suspenders included

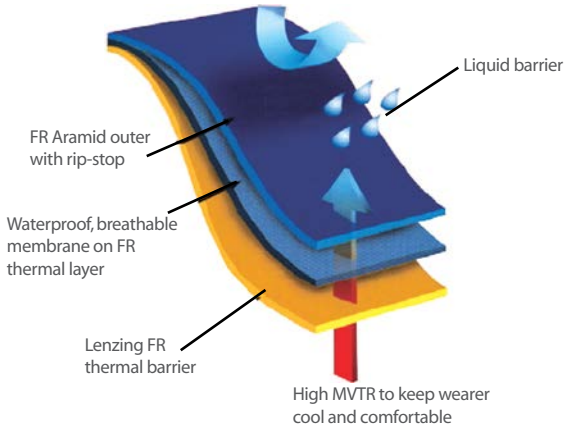
CE Certified fire fighters turnout gear in lightweight materials and including Lakeland Drag Rescue Device as standard.

- Based on the Lakeland's US 'OSX® Attack' design, the CE OSX® EN certified fire fighters turnout gear uses lightweight materials to ensure comfort and freedom of movement in the most demanding call outs.
- As standard CE OSX® includes features such as the Lakeland DRD - Drag Rescue Device, radio clip and re-enforced knee-pads.
- Lakeland also manufactures a whole range of fire fighters clothing meeting the requirements of US NFPA standards, and can make a variety of styles and additional features. Contact Lakeland for more details.
- Advanced FR materials with two optional outer fabrics, lightweight design and features focused on those that make a real difference - so you don't have to carry around features you don't need.

CE OSX® Jacket features:-
- Throat protection tab
- Micro-clip for radio
- Inset sleeve design for superior freedom of movement
- Knitted Kevlar® cuff with thumb-hole for superior comfort and protection
- Adjustable drawstring waist for improved comfort
- Two hand-warmer pockets with drain holes
- Convenient liner pocket
- Lakeland innovative Drag Rescue Device - when the worst happens drag a downed colleague to safety
- Also available: long coat

CE OSX® Pants features:-
- Adjustable waistband for increased comfort
- Leather-bound edges for toughness and durability
- 8-point suspenders included
- Reinforced knee-pads for tough durability
- Slanted slash pockets

Fabric Construction



The 3 layer structure comprises of:		
Outer layer	Middle layer	Inner layer
2 options: Flexible FR Aramid with rip stop / Nomex®	Breathable moisture barrier membrane	Lenzing FR thermal barrier to enhance heat protection

Product Codes	
CE OSX® Jacket	CEOSX1000C [Size]
CE OSX® Pants	CEOSX1000P [Size]

CE Certification and Physical Properties Data

		FR Aramid Outer		Nomex® Outer	
EN Standard	Description	Result	EN Class	Result	EN Class
EN 469:2005	Protective clothing for fire-fighters	Pass		An optional outer fabric will be available soon. Updated details available on request.	
EN 1149-5:2008	Anti-static properties	Pass			
EN 13935-2	Seam strength	575.5N	4		
EN 367	Heat transfer - flame ($RHTI_{24}$)	17.2 sec	X2		
EN 367	Heat transfer - flame ($RHTI_{24-12}$)	>4s	X2		
EN ISO 6942	Heat transfer - radiation ($RHTI_{24}$)	>18s	X2		
EN ISO 6942	Heat transfer - radiation ($RHTI_{24-12}$)	>4s	X2		
EN 20811	Water penetration	>20kPA	Y2		
EN 31092	Water vapour resistance	<30m² Pa/W	Z2		

Additional Information

Selection, Use, Storage, Shelf-Life and Disposal

Selection of the correct protective clothing for the task is important in ensuring adequate protection, optimum comfort and minimal cost. Whilst ensuring certification to the appropriate standards related to the application is a good starting point, CE standards represent MINIMUM required performance and selection may depend on a combination of factors relating to the hazard, the task and the environment, many of which may NOT be addressed by standards. Furthermore, standards generally deal with hazards in isolation whereas in the real world users often face multiple hazards at the same time; if more than one item of PPE must be used it may be important to consider how they work together and whether use of one compromises effectiveness of another (e.g, if both chemical and FR protection is required, you cannot simply wear a standard chemical suit over a thermal protective garment *(see Pyrolon™ introduction, page 30)*.

For a guide to factors for consideration in selection of chemical suits and Type 5 & 6 coveralls refer to Lakeland's Guides to selection.

Use

Before use, all suits should undergo a thorough visual inspection to ensure there are no tears, wear or other damage evident and that zips and elastic are intact and function correctly. Do not use any garment with apparent damage or wear as this will compromise protection.

Donning and doffing (especially the latter during which suits may be contaminated) is a critical part of the application; correct donning is vital in ensuring correct protection is provided. Lakeland recommends written donning and doffing procedures are established and that a "buddy" system, in which a colleague assists in both donning and doffing and conducts the final check, should always be used. Detailed advice on donning and doffing is available from Lakeland separately and a video on donning and doffing of chemical suits is available on the web site.

During use where possible monitor suits for damage, wear or contamination. Damaged or heavily contaminated suits should be removed, disposed of and replaced as soon as possible.

Re-Use

Most Lakeland garments are designed as single use and disposal is advised after one use. However, regardless of age, or whether a garment is classed as "disposable" or "re-usable", if a garment is undamaged and uncontaminated by any chemical, it may be re-used if appropriate.

Note however that any fabric that has been previously contaminated by a chemical may have a lower breakthrough time than when new. Contaminating chemicals may permeate into the fabric and cannot be removed by a decontamination shower or other cleaning method; de-contamination may remove chemical on the surface but will not remove chemical that has permeated into the fabric. Thus we do not advise re-use of contaminated suits (whether 'disposable' OR 're-usable') that have been contaminated by a hazardous chemical.

ALM® Suits

ALM® suits rely on the reflectivity of the aluminised surface to reflect away radiant heat energy. Thus it is vital that suits are kept clean; a dirty aluminised suit will not work! Suits can be wiped clean after use with a weak detergent solution and should be hung to dry before storage. Also ensure suits that are torn or damaged are also not re-used as this might also affect reflectivity.

Interceptor® Plus

All Interceptor® Plus gas-tight suits are pressure tested to ensure leak-tightness before leaving the factory. However, we recommend pressure testing of Interceptor® suits on receipt before use (to ensure no damage has occurred in transit) after every use before storage and/or as part of an annual service program.

Note: that it is entirely the user's responsibility to determine if re-use of a garment is safe.

Packaging

Most chemical and Type 5 & 6 coveralls are supplied in individual, sealed, vacuum packed polyethylene bags. (Vacuum packing saves 20 to 30% of freight and storage cost) and in outer cardboard cartons. Larger garments such as ARC® 43, Interceptor Plus® and ALM® are supplied individually.

Storage

Most Lakeland chemical suits are manufactured from polymers which are inert materials and are unaffected by normal temperatures and conditions. They can be stored in normal storage facilities. Keep dry and avoid strong light or sunlight or temperatures below -15°C

Larger garments such as ARC® and ALM® garments are better stored by hanging. If storing for re-use ensure garments are dry and clean before storage.

Training

Training on selection, use and maintainance, include pressure testing of gas-tight suits is available on request from Lakeland staff.

Shelf-life

Lakeland chemical and Type 5 & 6 suits are generally constructed from inert polymers that are unaffected by normal storage conditions. In unopened bags and in such conditions (-10°C to 50°C, dry and away from direct light) the expected shelf life can be 10 years or more. Some discolouration of fabrics may occur over time, but this merely relates to seepage of dyes and does not affect fabric performance.

However some specific properties of fabrics MAY alter over time. In particular anti-static properties result from a topical treatment which will degrade over time and in use *(see page 28)*.

It is vital that all garments, regardless of age, but especially after a longer shelf life, are thoroughly checked for damage or wear immediately before use. Do not use any garment that appears worn or damaged. It is always the end user's responsibility to ensure any garment is fit for purpose.

Interceptor Plus®

Interceptor Plus® is a EN 943 Type 1a gas-tight garment that fully seals the wearer against harmful gases and vapours in the environment. Leak tightness is confirmed through the use of an internal pressure test which inflates the suit and then ensures it does not lose pressure over time.

Because damage may occur during freight we recommend that Interceptors® are pressure tested on receipt to ensure leak-tightness. For suits in storage we also recommend that a regular maintenance procedure should be established with checks every 6 to 12 months maximum that includes both an internal pressure test and a detailed visual check.

We also recommend that if possible Interceptor® suits should be pressure tested before use and after each use before being stored for re-use. Any suit that fails a pressure test should not be used in any hazardous area but may be downgraded for training purposes and should be clearly marked 'Training Suit Only'.

All chemical suits should as a minimum undergo a thorough visual inspection before every use. Look for abrasion, tears, wear and any damage that might compromise protection. If in doubt do not use a suit in a hazardous area. Training and instructions on conducting pressure tests are available on request.

Disposal

Uncontaminated garments can be disposed of as standard waste according to local regulations. However, contaminated garments may require decontamination before disposal and must be disposed of according to regulations relating to the chemical concerned.

CE Certification

All garments presented are certified to relevant CE standards. Lakeland's policy is to ensure where possible garments are certified to the latest versions of standards. As required by the new PPE Regulation EU 2016:425 Declarations of Conformity for all products are downloadable from **www.lakeland.com/europe** and copies of CE certificates are available on request.

Selection of protective clothing means choosing the best garment for the task in hand. This is important not only in ensuring adequate and effective protection, but also in optimising comfort and minimising cost.

CE certification ensures garments meet minimum performance requirements and is a good starting point for selecting the best suit for the job. However, every application is different and meeting CE minimum performance requirements does not mean a suit is perfect for all or that operators are adequately protected. There are many factors relating to the hazard, the task and the environment that may affect garment choice and these should be assessed as part of a selection procedure.

Lakeland's Guides to Chemical Suit and Type 5 & 6 coverall selection provide useful guides to the various factors that might be important, along with explanations of tests, summaries of chemical permeation and penetration performance and detailed product information and comparisons.

Detailed product information is also available from individual product datasheets downloadable from **www.lakeland.com/europe**

Lakeland protective clothing provides an expanding range of options for protection against the hazards of chemicals, flames and heat.

Why choose Lakeland?
The wide choice of fabrics and styles means users can target protection more specifically to their unique application - which means better protection, optimal comfort and minimal cost. Lakeland offers the right tool for the job…
because if all you have is a hammer, everything looks like a nail…

Expertise from Experience
We are the experts. Lakeland was the original manufacturer of disposable protective clothing so our know-how is derived from several decades experience of developing, designing, manufacturing and supplying protective clothing. When you talk to Lakeland you talk to the experts.

World-Wide Presence and Growth
Lakeland is growing internationally with production and sales operations in every region and users of Lakeland products in over 40 countries. So we can bring you the best in fabrics, innovations and technical expertise and advice wherever you do business

Know the Maker
Lakeland Protects People. It is our core business. Our key products are developed by us, designed by us and manufactured in our own production facilities. Because we manufacture we have complete control over planning, quality and delivery.

We develop | We design | We make | We deliver

Let us help you Protect Your People™

Lakeland®

Nick Stevenson
Country Manager
Australia/New Zealand/Oceania
Mobile: +61 (0) 437 075 686
E: nastevenson@lakeland.com
W: www.lakeland.com

Lakeland Asia Pacific
Unit 503, Building B, Sinolight Plaza, No 4 Wangjing Qlyang Road,
Chaoyang District, Beijing 100102, P.R. China

T: +86 10 643 79226
W: www.lakeland.com
F: +86 10 643 79918
E: sales-ap@lakeland.com

Sign up to the Lakeland Blog for regular and informative articles on Protective Clothing.
https://blog.lakeland.com/australia

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